

# **The Archetypal Market Hypothesis**

A Complex Psychology Perspective  
on the Market's Mind

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***Dedicated to my teachers, both the good and the bad***

## ABSTRACT

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The thesis introduces the Archetypal Market Hypothesis (AMH). Based on complex psychology and supported by insights from other (mind) sciences it describes the unconscious nature of investing and how it shapes price patterns. Specifically, it emphasises the central role of numerical archetypes in price discovery. Its ontological premise is the market's mind, a complex adaptive system in the form of collective consciousness which originates from the collective unconscious. This premise suggests that investing involves more than cognition and reaches beyond rationality and logic.

Among others, the thesis clarifies the affective impact of price discovery: it is not only what we can do with prices, but also what they can do with us. Numbers receive their affective powers from the numerical archetypes. They preconsciously create order in the mind by facilitating the dynamics of symbolic mapping as the mind attempts to make sense of what it senses, bridging the imaginative with the real. This autonomous and often dominating impact of the numerical archetypes manifests itself:

- in individual consciousness via numerical intuition, and
- in crowd consciousness via participation mystique which underlies intersubjectivity.

The thesis will argue that both are supported cerebrally.

The collective intersubjective nature of the market's mind and its symbolic expression via prices make it an exemplary phenomenon to be researched because the archetypal dynamics are strongest in such spheres.

The PhD's goal, as part of the AMH proposition, is twofold. First, to formalise theoretically the concept of the market's mind, in particular the collective experience of market states, generally known as market moods, and how these shift as a result of herd instinct. Second, to propose a framework for further empirical research to show that representing market data in a non-traditional way, based on Jung's active imagination and similar techniques, can improve investors' understanding of those states. If successful, the method (including bespoke software) can complement analytical investment research methods currently used by investors.

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# CHAPTER 1. INTRODUCTION AND LITERATURE REVIEW

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*I take my milk from many cows but I make my own butter.*

Robert Louis Stevenson

## 1.1 INTRODUCTION<sup>1</sup>

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This introductory chapter includes a brief overview of the relevant literature (sections 1.3). It is in the form of a representative sample of the type of references included in this manuscript. In other words, the representative sample in this chapter is expanded, during the remainder of this thesis, to a purposive sample of references concerning the topic of research.

The reason for this consideration is that other approaches to a literature review are not practical in light of the three main disciplines from which this thesis extracts its material. It focuses on capital markets as the space where humans collect both material possessions and mental experiences at a massive global scale. Specifically, its central premise is that capital markets manifest collective consciousness, called the market's mind, and the three main disciplines informing this premise are finance, complex psychology, and philosophy (of mind). It should be obvious that, for

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<sup>1</sup> In this thesis I will randomly switch between gender as any writings apply to both masculine and feminine, unless specifically stated otherwise. I will use the double apostrophe symbols (") for quotes, whereas I will use the single ones (') for emphasis, uses of 'figure of speech', etc.

example, an exhaustive review of these disciplines would demand too much time and eventually would lead to a 'crowding out' of the other chapters because of its sheer size. On the other hand, this multi-disciplinary approach also leads to inevitable limitations in terms of the selective choice of sources (and the related exclusion of other references). That choice has not only been motivated by theoretical arguments but, crucially, also by practical relevance from an investor's perspective. Among the central questions driving this motivation was, for example, "How does this possibly relate to (the experience of) price discovery?" Specifically, I have included many references, e.g. quotes, from investment practitioners who have hinted at some of the concepts to be discussed, whereas I have excluded sources whose theories are related to the aforementioned disciplines but offer no practical insights.

As an exhaustive review is not required anyway, the specific problem formulation stated in chapter 6 allows this thesis to gradually shift from an initial representative sample in this chapter to a focus on pivotal articles and other publications which are central to it, i.e. morph into a purposive sample.

First, it is perhaps useful to provide a brief overview, including terminology, for those unfamiliar with economics, finance and investing, respectively mind sciences and complex psychology (e.g. archetypes). They will be discussed in more detail in the remaining chapters.

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### 1.1.1. ECONOMICS AND FINANCE

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Economics and finance are nested disciplines, with shared assumptions, particularly the Rational Expectations Hypothesis (REH).<sup>2</sup> Economics is the discipline which studies the economy, both at the macro level (regions and countries) and the micro level (corporations and individuals). The economy is generally prefixed with the word 'real' to signify that it consists of tangible objects, like factories, machines and products. Other physical manifestations of the economy include processes like the production, transportation and distribution of goods. They are often referred to as economic fundamentals. Finance deals with a subset of issues that belong more generally to economics, and particularly studies the capital markets<sup>3</sup> which determine the (allocation of) investments in the real economy. Specifically, capital markets facilitate transactions between owners of capital (e.g. investors and savers) and users of capital (e.g. companies and borrowers). Capital markets form the space where the real economy is bridged with the imagined one, where economic objects connect with economic subjects. By extension, investing is psychological arbitrage between myth and reality. Crucially, capital markets manifest both physical and mental properties. Physical properties include assets like real estate and commodities. Another example is the communication networks which facilitate trading, including computers and telephones. They form part of the market's fundamentals. Mental properties primarily involve market sentiment or mood<sup>4</sup> which emerge from price dynamics, like volatility. To roughly relate this to the mind

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<sup>2</sup> For a brief overview of uncommon explorations of economic theory, see for example Kutler (2010).

<sup>3</sup> I use the term capital markets to refer to all security markets. Formally only securities with a duration beyond one year are traded on capital markets, whereas those with shorter durations are traded on "money markets". I also on occasion use the term "financial markets".

<sup>4</sup> For the purpose of this thesis the reader can equate the two, but there are slight differences, and I prefer to use the term mood. See explanation in next section.

sciences (see next section), fundamentals can be considered the market's 'brain states', whereas moods are the market's 'mental states'.<sup>5</sup>

Obviously humans, in all their bodily and mental capacities, inhabit both the economy and the capital markets. On that note, economics and finance, reflecting collective human nature, have something to contribute in answering the question whether physical laws exhaust nature's laws (or whether there is something in addition).

The main tool used in the exchanges that take place in markets (of goods and services, respectively securities) is money. Money is a social, trust-based construct that is used as a medium of exchange and (electronic) record of account. In today's modern (fiat) currency system money is credit and has symbolic, but no intrinsic value. As Bagehot (1873, p. 151) pointed out: "The peculiar essence of our financial system is an unprecedented trust between man and man; and when that trust is much weakened by hidden causes, a small accident may greatly hurt it, and a great accident for a moment may almost destroy it." In fact, there is not much evidence to support the general assumption that the earliest trade was purely based on barter. Rather promises to pay for goods and services 'later' facilitated such trade (e.g. Graeber, 2011). This underlines the ancient use of credit, as well as trust (e.g. 'credit-worthy') being the early psychological foundation of trade. The social and symbolic nature of money puts it right into the collective dynamics that complex psychology studies. There are various forms of money, the main ones being cash (e.g. coins) and deposits. For more details of the modern monetary system, money creation and the role of banks, see McLeay et al. (2014-i and 2014-ii).

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<sup>5</sup> In the following, "the market" refers to the (complex adaptive) system of markets, so the composite of global bond, equity, currency and other capital markets.

Within economics and finance there are various sub-branches. As far as finance is concerned, the dominant paradigm is called the Efficient Market Hypothesis (EMH) which assumes investors behave rationally and advocates an equilibrium approach to markets. Equilibrium is an idealised market state where demand equals supply. In recent decades behavioural finance has started to challenge this paradigm. EMH also argues that active investment management, i.e. trying to “beat the market” is futile. Not surprisingly, practitioners have always been sceptical about EMH’s assumptions and apply fundamental, quantitative and technical analysis in an attempt to outperform their markets and/or their peers.

Price discovery is the process of finding the price of an asset in a market through the interactions, specifically exchanges, of buyers and sellers, i.e. by way of trading. A market ‘clears’ at that price, suggesting a temporary equilibrium between demand and supply during which an exchange or trade takes place. The topic of intrinsic value is important but also vast, and I can’t discuss it in too much detail here.

Although EMH argues that the price equals the intrinsic value of an asset, this is not a generally accepted assumption. Value in general is in the eye of the beholder.

Living investment legend Warren Buffett<sup>6</sup> defined intrinsic value as “the discounted value of the cash that can be taken out of a business during its remaining life”.

Furthermore he emphasised that “Regardless of price, we have no interest at all in selling any good businesses that Berkshire owns.” Others<sup>7</sup> have translated this as: a risk asset’s intrinsic value is the maximum price an investor is willing to buy the asset for without the ability to ever sell it again. For example, compared to a 10-year risk-free bond, where the investor is guaranteed to get her money back in 10

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<sup>6</sup> In his 1999 letter to shareholders of Berkshire Hathaway, <http://www.berkshirehathaway.com/owners.html>. Downloaded 14/04/2012.

<sup>7</sup> See, for example, Philosophical Economics (<http://www.philosophicaleconomics.com/2014/12/what-is-intrinsic-value-and-who-decides-it/>; downloaded 28/12/2014)

years, buying a stock for its intrinsic value means that at that price the investor is willing to hold the stock forever. In other words, the ability to trade, with related issues like liquidity and sentiment, is crucial as far as the relativity of intrinsic value is concerned.

In capital markets assets are mostly traded on exchanges via securities (like bonds and stocks). Any trading that does not take place via exchanges is called over-the-counter (OTC). Securities are contracts embedding rights of ownership to assets, including their cash flows. A security, e.g. Apple stock or UK Gilt, is the object of shared attention between investors, expressed symbolically in numbers and letters. That is to say, apart from prices a security is also characterised by an accompanying story which justifies buying respectively selling the security. Particularly in times of heightened excitement, when e.g. "insecurities [reveal] themselves in securities" (Haldane, 2015, p. 5), as well as in hindsight, this can turn into confabulation. The observation that these stories are often anchored to a recurring theme, across time and markets, makes mythology so relevant, for example.

Our environment throws up events (external surprises) which have a potential economic impact on our lives, e.g. lifestyles. Being exposed to, respectively hedged against those events can be beneficial compared to not having such status. The way to achieve this is to buy or sell resources which help to deal with those events. As such they offer value, e.g. compensation for any loss. Specifically, by trading securities investors can gain or remove exposure to resources in the real economy. Those resources are scarce and can vary from purely physical, like gold or property, to less tangible resources like the right to tax (often the monopoly of a government). The motivation to engage in such transactions is thus to deal with uncertainty and, to the extent possible, to manage risk emanating from these events. This points to

the type of events we can encounter. Uncertainty means that neither the outcome nor the distribution of events is known. Risk means that the outcome of events is unknown but the distribution is. The difficulty to assess these two, or rather to make a distinction, is among the biggest challenges in price discovery.

Prices are like Janus' head: they reflect the polarities of economic life, in particular the past and the ('discounted') future, as well as risk and return. Risk embedded in exposure is compensated with a potential return, i.e. each asset has a risk/return profile. Among the most significant risk characteristics of assets, which simultaneously signifies the transition between physical and mental properties of the market, is liquidity. In short, liquidity is a measure of the ease with which an asset can be exchanged for another asset. An asset is more or less "liquid" if it can be more or less easily traded. This is intimately related, among others, to the balanced number of investors who trade in the security. In other words there need to be buyers and sellers who are willing to expose themselves to, respectively rid themselves of the risks of the underlying asset. A large number of participants (both buyers and sellers) increase the market for a security and consequently its liquidity. Another way of saying this is that they occupy a large space for price discovery. Cash, for example, is the most liquid asset. This lowers its risk profile and therefore the likely return.

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### 1.1.2. MIND SCIENCES

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Mind sciences consist of the various disciplines involved in studying the brain, mind, and consciousness. I include neuroscience, philosophy, psychology, and sociology. Mind, in simplified terms, consists of the processes involved in the interaction of the brain with the body-proper, including the nervous system. Often a distinction is



made between brain states and mental states, whereby any correlation between the two is an important area of research. These processes extend to the outside world, particularly other minds, and can be experienced which involves consciousness. I use the terms mind-body problem and psychophysical or "hard" problem interchangeably to refer to the problem of explaining the nature of consciousness. When I mention and discuss minds separately from other objects or entities it is to clarify the distinction between these spheres, rather than reflect agreement with, let alone promote, dualism. I have attempted to follow generally accepted uses of terms like qualia, sensations, feelings and intersubjectivity. Specifically, in contemporary philosophy, as well as psychology, intersubjectivity<sup>8</sup> is the general term used to describe the state of shared experience which manifests itself in social behaviour, for example via herding.

Mood should be interpreted according to contemporary mind sciences. Mood in general is the term philosophers use to refer to phenomenal consciousness which concerns the highest qualitative characteristics (or qualia) of a state of mind. Moods are peculiar. For example, while they complete other mental expressions (e.g. emotions and thoughts), compared to these moods have no unconscious variant. Neither can they be accessed consciously as they are not representations nor representational. Moods are general feelings not directed at anything particular. They generally have a longer duration than, say, emotions. Although moods are often labelled as 'positive' or 'negative', in the words of philosopher Jaegwon Kim, "moods don't have satisfaction conditions; they cannot be accurate or inaccurate, true or false . . . Evaluating moods in terms such as "accuracy" and "fidelity" doesn't make any sense". (2011, pp. 278, 293). For our purposes mood refers to the quality

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<sup>8</sup> Interpretations of intersubjectivity evolved from the philosophies of, among others, Buber, Husserl, Heidegger, Sartre and Habermas.

of the market's mind in terms of a composite feel, i.e. what the market feels like when you're 'in it'. In other words, mood infuses the market as a shared feeling experienced, although not necessarily uniformly, by participants who have skin in the game. It is this intersubjectivity of participation that distinguishes it from whatever any individual investor<sup>9</sup> feels subjectively about the market, e.g. even if you are worried, you can sense the market's exuberance simultaneously (you can't escape it and ignoring it, to paraphrase Keynes, is at your own peril). Finance, however, has misinterpreted mood (see, e.g., chapter 6) and modern finance in particular (conditioned by its "physics envy", see chapter 2.2) considers it as epiphenomenal: its properties make no difference to the compositional or causal facts of the market that are already determined by its physical properties.

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### 1.1.3. ARCHETYPES

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Complex psychology, also known as analytical psychology, was originally developed by the Swiss psychologist Carl Gustav Jung. The collective unconscious and the archetypes are the best known among the concepts he popularised. The following provides a brief interpretation of archetypes which is further explained, applied, and expanded upon in this document. Motivated by the essence of price discovery, there are two main aspects to my thesis that distinguish it from mainstream complex psychology. First, it emphasises the phenomenal manifestation of archetypes (i.e. archetypes are experienced by way of their images and this experience is crucial for their understanding). Second, I make a distinction between traditional archetypes and the numerical archetypes.

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<sup>9</sup> Let alone a non-participating observer.

An archetype is an inherent psychic subroutine in the form of an unconscious mandate to symbolise via a self-image, called the archetypal image. Stated differently, the archetype is an unconscious entity and the archetypal image is its conscious identity. Specifically, within an archetypal situation the archetype mandates the release of the neuronal firing pattern underlying its image. This makes an archetype self-referential/reflexive, whereby the archetypal image influences the release (and by extension shape) of the neuronal firing pattern while it emerges. It is this recursive feedback between the archetype and its image, combined with the interaction with other archetypes, which makes an "archetypal experience" dynamic and an "archetypal situation" evolve.

The unconscious, by way of the archetypes, enables the mind to deal with the uncertainty of the unknown, i.e. to imagine. It is in the unconscious where such novelty and innovations like 'insights' endogenously originate for the mind, a necessary requirement for any complex adaptive system (or CAS) to flourish. The adaptive purpose of archetypes is thus to provide prerational 'surprise' information as inputs to form categorised symbolic meaning, leading to an intuitive understanding of an emerging archetypal situation. In healthy humans this reduces incomplete knowledge and increases emotional fitness in terms of a 'gut feeling' response to this situation. Often this response is of a compensatory and selective nature in order to rebalance emotional, respectively rational, excesses.

Numerical archetypes are archetypes which symbolise via numbers, e.g. the natural integers. They are the prime archetypes because they enumerate, both cardinals and ordinals, thereby providing values required for selection, the main dynamic of evolution. Applied to the mind, and in terms of archetypal dynamics, numerical archetypes facilitate the selection by archetypes of ". . . those contents which are

best suited to themselves” (Jung, 1911-1912, para. 232). In general, numerical archetypes enable the numerical operations required for all archetypal dynamics, typical examples being differentiation and integration, while bridging the mental with the physical.

I thus use the plural ‘numerical archetypes’, not because each number requires an archetype, but because the (e.g. biophysical) numerical operations mandated via these archetypes involve multiple numerical archetypes. Their interaction, more than that among any other archetypes, underlies the complexity of archetypal dynamics. In that light, numerical archetypes can be viewed as mandates to exchange values with, and thus influence, the emerging archetypal situation. Specifically, these include the coordinates for archetypal images to emerge in consciousness, i.e. in space time. In the final analysis, numerical archetypes perform the autonomous valuation of, i.e. attach a number to, our emotions. This category of archetypes “preconsciously orders *both psychic thought processes and the manifestations of material reality*. As the *active ordering factor*, it represents the essence of what we generally term ‘mind’” (Von Franz, 1974; emphasis mine). Translated for finance, the numerical archetype is most directly reflected in price, which is the ratio of the respective number of units of the items that are exchanged, with the embedded oppositional tension between supply and demand (see also sections 5.4 and 8.2). As I will emphasise repeatedly throughout this thesis, the question is not only what we do with prices, but *what they do with us*. Archetypes are discussed in more detail in chapter 3 as well as in the Appendix.

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#### 1.1.4. RELEVANCE OF JUNG FOR FINANCE

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In the spirit of observations by Leibnitz, Twain, and others, financial history may not repeat itself exactly, but it clearly rhymes. Yet, despite many attempts to explain the repetitive patterns in collective behaviour of investors, best exemplified in booms and busts, economics (and by extension finance) has been unable to provide a comprehensive hypothesis as to the underlying causes for this. Ironically it was Alan Greenspan<sup>10</sup> who hit the nail on the head when he stated that current practice does not

fully capture what I believe has been, to date, only a peripheral addendum to business-cycle and financial modelling – *the innate human responses that result in swings between euphoria and fear that repeat themselves generation after generation* with little evidence of a learning curve. Asset-price bubbles build and burst today as they have since the early 18th century, when modern competitive markets evolved. To be sure, we tend to label such behavioural responses as non-rational. But forecasters' concerns should be not whether human response is rational or irrational, only that it is observable and systematic. This, to me, is the large missing "explanatory variable" . . . Current practice is to introduce notions of "animal spirits", as John Maynard Keynes put it, through "add factors". That is, we arbitrarily change the outcome of our model's equations. Add-factoring, however, is an implicit recognition that *models, as we currently employ them, are structurally deficient*; it does not sufficiently address the problem of the missing variable. (2008; emphasis mine)

Jung specialised in such "innate human responses", particularly those expressed collectively via highly charged and uniform emotions. After a dispute with his erstwhile mentor Sigmund Freud, Jung developed complex psychology of which the collective unconscious and the archetypes are probably the best known concepts.

Jung explains the key difference between their theories:

Freud . . . derives the unconscious from the conscious. . . . I would put it the reverse way: I would say the thing that comes first is obviously the unconscious. . . . In early childhood we are unconscious; the most important functions of an instinctive nature are unconscious, and consciousness is rather the product of the unconscious. (Jung, CW18, 14f)

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<sup>10</sup> Former Chairman of the US Federal Reserve.

Due to the observed uniformity (across time, cultures, and individuals) in the expressions of the unconscious (e.g. dreams, myths, symbols, etc.) Jung developed the concept of the collective unconscious. It forms a deeper layer within the unconscious mind, like a cellar in a public museum containing primordial artefacts of past generations which continue to influence individual contemporary art. To emphasise this collective characteristic Jung (1957/1972) contrasts the collective unconscious to the personally acquired contents of the more superficial layers of the personal unconscious. Among the early economists who touched on the unconscious processes that guide our behaviour Hayek (1967, p. 60-62), for example, prefers to call them "supra-conscious" or "meta-conscious". Interestingly, he links this to Gödel's theorem, states that creativity is "due to processes of this kind", and considers the unconscious causal and primary. Specifically, he talks about the "primacy of the abstract" as if to echo Jung's primacy of numbers.

In terms of contemporary mind models, Jung's archetypal hypothesis is one of the earliest dual-aspect (or dual-systems<sup>11</sup>) models of the mind, which in turn fall under neutral monism. For a more detailed discussion on specifically the Pauli-Jung version of dual aspect theory of mind see Atmanspacher (2012; but see also Atmanspacher and Primas, 2006). For a psychoanalytical angle on dual-aspect, see particularly Epstein (1994). More recently, see Kahneman (2011), Loewenstein and O'Donoghue (2004) and Slovic et al (2004) as well as the references therein. Finance and dual aspect theory can be mutually relevant to each other. Their meeting ground lies in the treatment of information. Specifically, finance tells us that prices can be considered concentrated information conduits. They are objective and verifiable data points while, simultaneously, being intersubjectively experienced. Consequently, the

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<sup>11</sup> So I place dual-aspect theory in this broader category.

gap that is usually assumed in dual-aspect approaches between sterile raw information on the one hand and the intimate feelings associated with consciousness on the other, i.e. the phenomenal properties of becoming aware of that which is 'information', does not exist, i.e. is bridged, when prices are discovered.

Although I will focus on complex psychology, I briefly want to touch on the (ir)relevance of other depth psychology approaches. For example, in psychoanalysis a number of references are made to economics.<sup>12</sup> Freud himself once held the view of psychoanalysis as "a sort of economics of nerve force" (Freud, 1895). It was an early application of the laws of supply and demand to mental resources.<sup>13</sup> Birken (1999) argued that Freud's use of the term "economic" implied that his new psychology was somehow analogous to the earlier science of political economy, precisely because he had extended to the private sphere the quantitative approach already employed to analyse the public sphere. Primarily by analysing children's play, Melanie Klein expanded Freud's theory (e.g. Segal, 1988), for example by developing the concept of the internal object and clarifying symbol formation. Perhaps by considering investing as a play and investor behaviour as infantile<sup>14</sup> Klein's approach offers a possible psychoanalytical extension of game theory as applied to investing? In light of the collective aspect of market psychology, as well as the central role of numbers (and math) in investing, Ignacio Matte Blanco's approach to the unconscious seems relevant (e.g. 1988). Specifically, his principle of "Generalization" whereby the unconscious does not take account of individuals as such but considers them as members of (classes of) classes, provides a possible explanation for the subliminal forces that drive group/crowd behaviour in markets.

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<sup>12</sup> The US investor Randy Updyke is among the few practitioners who are known to have combined finance and psychoanalysis.

<sup>13</sup> For a modern, albeit non-psychoanalytical view, see for example Rolls, 2007.

<sup>14</sup> E.g. B. Barber and T. Odean. 2001. "Boys will be Boys: Gender, Overconfidence, and Common Stock Investment", *Quarterly Journal of Economics*, Volume 116, Issue 1, pp. 261-292.

His second principle of "Symmetry" may be applicable to the phenomenon of reversals in price action, whereby the initial price move is "symmetrically" reversed. The theory of Jacques Lacan (e.g. 2007) centres on three orders of mentality, which he called The Imaginary, The Symbolic, and The Real. He also emphasises language, for example to transform images into words. Perhaps the most relevant aspect of Lacan's theory is his positive view on trial and error, i.e. learning, whereby his "discourse" shows a close resemblance to Kuhn's "paradigm". Paul Kugler (2003) explores the role of language, e.g. sound and images, in psychological life, particularly at the origin of subjectivity. Among others, he links Jung's early word associations with Lacanian psychoanalysis. Although language is not the prime focus in this thesis, this book could be relevant for future explorations of narratives of investment themes, as well as the broader role of sounds and images in recognising (psychic) patterns. More recently, Anne Dailey (2000), a professor of law, argues that cognitive psychology fails to comprehend the important role that unconscious emotions and irrational motives play in human affairs. She advocates that psychoanalytic research offers law and economics, in part, an economic theory of the mind, "a model for understanding how internal mechanisms of exchange affect our transactions in the world". David Tuckett (2011) has introduced his interpretation of 'emotional finance' which draws on principles of psychoanalysis to understand financial markets. Among the more innovative elements of his research were his interviews with fund managers.<sup>15</sup> His interpretation of "phantastic objects" in terms of wishful fantasies during financial hypes is an interesting alternative to existing ones. Finally, Niklas Hageback (2014) published an excellent introduction to viewing markets through a Jungian perspective. Although he only makes a casual reference

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<sup>15</sup> Although Kames Capital participated in the early phase, in a private conversation David told me he hadn't included Kames' results in the final findings.



to numerical archetypes he introduces an interesting framework for categorising words and other items from newsfeeds and social media according to archetypal symbols.

Overall, however, I feel I am stretching my imagination here. Apart from Hageback I find it hard to see any (practical) relevance in these approaches. Compared to my interpretation of complex psychology, all these sources lack a clear link to price discovery. In particular, they overlook the crucial archetypal role of numbers in the process of price discovery, as the ultimate reflection of the “oppositional structure” of the market’s mind. This theoretical angle and its practical implications are what makes Jung unique and what this thesis focuses on. Specifically, the limitations of the psychoanalytic approach to capital markets in general, and investing in particular, originate from its lack of any coherent hypothesis on the autonomous, i.e. unconscious, (collective) dynamics of numbers, as symbolised in prices. Furthermore, compared to Jung’s active imagination, it lacks a method which allows market data to be presented in a format which appeals to the non-analytical capabilities of the mind (see chapter 10).

There are a few analogies to make the relevance of Jung’s theory to the capital markets more intuitive. First, the following quote from Jung about the collective unconscious echoes the general sense investors have about the “market’s mind”:

we might think of it as a *collective human being* combining the characteristics of both sexes, transcending youth and age, birth and death, and, from having at its command a human experience of [more than] two million years, practically immortal. If such a being existed, it would be exalted above all temporal change; the present would mean neither more nor less to it than any year in the one hundredth millennium before Christ; it would be a dreamer of age-old dreams and, *owing to its immeasurable experience an incomparable prognosticator*. It would have lived countless times over again the life of the individual, the family, the tribe, and the nation, and *it would possess a living sense*

*of the rhythm of growth, flowering and decay.* (CW8, para. 673; emphasis mine)

Second, whereas the collective unconscious rebalances via archetypes, the market rebalances via the elusive risk factors. Both archetypes and risk factors deal with systematic themes (this analogy will also be explained in more detail in chapter 9).

Another overlap is that archetypal situations become more pronounced, in the sense of becoming more sensitive to primordial responses, when they involve large numbers of interacting humans whose minds converge towards numerical symbols.

This is the implied conclusion from Jung's most crucial insight: towards the end of his life Jung realised that numbers must form the core or prime archetypes.

Numbers are prime archetypes because they cannot be further reduced, in the sense that:

[If] a group of objects is deprived of every one of its properties or characteristics, there still remains, at the end, its number, which seems to indicate that number is something irreducible. (1955, p. 57)

This captures the spirit of EMH and technical analysis, for example, which both emphasise the primacy of prices, e.g. as information carriers. The numerical archetypes also represent the dynamics between the physical (quantity) and the psychic (quality), as well as between nature (discovery) and nurture (learning):

I always come upon the enigma of . . . number. I have a distinct feeling that number is a key to the mystery, since it is just as much discovered as it is invented. It is quantity as well as quality<sup>16</sup>. . . [number] may well be the most primitive element of order in the human mind . . . thus we define number psychologically as an archetype of order which has become conscious. (In Von Franz, 1974, p. 9, 45)

Furthermore, Jung always emphasised the probability structure within the unconscious that archetypes provide to the mind: "The archetype represents *psychic*

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<sup>16</sup> Jung's original term here was translated as "meaning", but I feel "quality" better fits the distinctions he's making.

*probability*" (CW8, para. 964). This again underlines the primacy of the numerical archetype because it subliminally enables the mind to assess the potentialities of other archetypal images (e.g. instincts) occurring, in short to subliminally translate them into archetypal expectations.

But what about the person Jung, and what did others think of his theory? As a person Jung is, ironically and sadly, the archetypal persona-non-grata in science. His reputation remains so controversial that hardly any scientist dares to refer to his theories or mention his name. As a consequence of this taboo, it has become common and accepted practice, albeit shameful, to pour his old wine in new flasks without crediting him. This has been highlighted in various books (e.g. Cope, 2006; Stevens, 2002; Mlodinow, 2012). Combined with the disastrous management of his legacy by his average followers, the Jungians, this forms the true tragedy of Jung.

A historically well-researched account which attempts to correct the misperception of Jung is *Jung and The Making of Modern Psychology: The Dream of a Science* by professor Shamdasani (2005). He also coordinated the much anticipated recent publication of Jung's Red Book which generated renewed interest, both from academia as well as from the media.

There are other exceptions to, what Cope calls, the "fear of Jung". The contribution by Jung to build a bridge between mind and matter was acknowledged, for example, by Heisenberg-pupil Fritjof Capra who stated that ". . . many others have published books about this subject, many of them preceding *The Tao of Physics*, beginning way back with Carl Gustav Jung" (1999, p. 340). Capra's own work, linking physics to psychology, builds on Jung's cooperation with physicist Wolfgang Pauli. Pauli realised the broad implications of Jung's archetypal hypothesis, including the scientific ones:

When one analyzes the pre-conscious step to concepts, one always finds ideas which consist of "symbolic images." The first step to thinking is a painted vision of these inner pictures whose origin cannot be reduced only and firstly to the sensual perception but which are produced by an "instinct to imagining" and which are re-produced by different individuals independently, i.e. *collectively* . . . But *the archaic image is also the necessary predisposition and the source of a scientific attitude*. To a total recognition belong also *those images out of which have grown the rational concepts*. (1948; emphasis mine)

Potentially of even more relevance for investing, Pauli wrote regarding archetypal expectations:

It cannot be excluded that the images, which certainly exert a strong influence on the direction of conscious attention (even if they remain unperceived), are not only to be causally evaluated as a backslide to pre-scientific thinking but also finally directed to a goal. In the latter regard, *they might contain the seeds of anticipated future developments*. (In Atmanspacher and Primas, 2006; emphasis mine)

Beyond Pauli, a few other physicists were aware of the archetypal hypothesis. One of Pauli's contemporaries, Carl Friedrich von Weizsacker, referred to it during a lecture which he gave a few years after the death of both Jung and Pauli:

Science itself is based on archetypes. The archetypes predominant in modern science are those Plato called mathematical. . . . But what is given us as the a priori of mathematics, what belongs to the preconditions of the possibility of distinguishing objects that differ from one another and remain identical with themselves in time, by no means constitutes the whole of the Platonic idea: i.e., what Plato calls the idea itself. This idea contains a great deal beyond the mathematical, and it is into these regions that Jung, I think, cast a glance, to see, if only for a fleeting moment, a contour amidst the swiftly moving clouds. More is not to be expected at this point. (In Card and Morariu, 1998)

Jung's collective unconscious relates closely to the collective consciousness concept of Emile Durkheim according to Pierre Janet, the famous child psychologist who knew both men. In a tribute to Jung, he stated:

that which Durkheim, prophet and sociologist just as Jung is a prophet and psychologist, attributes to "collective consciousness", Jung searches in the "collective unconscious". And yet these anti-thetical entities come close more often than one believes and it would be very interesting, in

times to come, to analyse their possible interference. (In Shamdasani, 2003, p. 288, 289)

Finally, Nobel laureate Konrad Lorenz, one of the founding fathers of animal ethology (in which evolutionary psychology is rooted) acknowledged the validity of Jung's archetypal hypothesis. Discussing the innate human responses, he commented:

this innate releasing mechanism, as we call it, combining with the human faculty of visualizing—dreaming about a situation, results in phenomenal reactions which are more or less identical with Jung's concepts of the archetypes. I think archetypes are innate-releasing mechanisms invested in visualizations, in fantasy. (Ibid, p. 258)

Further advances in evolutionary psychology, as well as neuroscience and other mind disciplines have indeed largely confirmed, albeit using their own terminology and often without credit, Jung's earlier insights regarding the mind (see, for example, Stevens, 1990; Solomon, 2000; Mlodinow, 2012).

To conclude, if nothing else, the ongoing financial crisis suggests modern finance is in need of a revision which reaches beyond the description of anomalies that behavioural finance provides. Although the latter has undisputedly shot holes in the ivory tower of the EMH, the early foundations for an alternative structure are being built on shaky grounds because they are ignoring the underlying cave upon which these foundations are being build: the unconscious. In markets, the collective nature of the unconscious is the source of the uniform affects which drive investor behaviour. Ultimately, all routes to and from consciousness return to this important element in complex psychology.

For the remainder of this chapter I will, first, give reasons why the topic of my thesis is important. Second I will provide an overview of the additional literature on issues relevant for this topic. Finally and consequently, I will place my research in the proper theoretical context in terms of the disciplines which provide the insights for it.

## 1.2 RELEVANCE TOPIC

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As aforementioned, complex psychology was originally developed by the Swiss psychologist Carl Gustav Jung. Among the concepts he popularised are the collective unconscious and archetypes. These and other Jungian concepts will be particularly discussed in chapter 3.

In a broad sense, Jung's advice to take an integrative approach to the unconscious in general and the emotions in particular seems, at first, outdated in the world of modern finance where rationality and algorithms dominate current thinking and practise. However, looking more closely the servants of Mammon have not changed. In fact, such crowding out of emotions has contributed to the problems we have been experiencing, possibly building up since the late 1970's when modern finance emerged.

More specifically, the main topic of this thesis is the role of numerical archetypes in price discovery, based on the premise that capital markets manifest collective mentality or consciousness, called the market's mind. The latter, combined with the market's body, forms an animated entity, a composite of human market participants and their extensions. This ontological commitment to the mind-body contrasts with the commitment to the machine made by the currently dominant finance theories. Counter arguments to my overall thesis ultimately boil down to not recognising (or simply dismissing) this distinction. In short, and at the risk of generalising, I believe readers will broadly agree with me once they recognise that the market's mind cannot be reduced to 'just' investor psychology, but actually involves consciousness. And the phenomenal qualities of the market's mind, experienced for example as

despair or exuberance, are distinct features. As we know, that is already a hard problem in and of itself, but its denial by mainstream finance is adding to our troubles. On that note, those who disagree will generally consider the economy and capital markets as machine-like. I am not so naive to believe I can convince them of my arguments. On the other hand I will attempt to clarify why their arguments are less convincing. Specifically, the mechanical perspective of equilibrium approaches, in my view, completely fails to explain the natural occurrence of (as in 'the endogenous ability to generate') novelty and innovations which the economic system requires in order to adapt. Instead, the complex approach whereby discoveries are (often painfully) made via trial and error by competing and cooperating forces applies to both the mental and market domain. Driven by evolution's urge to survive and improve our life these dynamics built (on) the "deposits of human experiences"<sup>17</sup> and their associated tools and innovations from which humanity progresses and prospers. This is not always straightforward and often, as Keynes pointed out, "The difficulty lies not so much in developing new ideas, but in escaping from the old ones". This will be explained in more detail later, particularly in chapters 2 and 6.

My interpretation of numerical archetypes, i.e. their empirical expression in the form of prices, contributes to the debate concerning Jung's later work. As I will argue in chapter 5, Jung's conclusion that the numerical archetypes form the prime archetypes is of seminal importance to lift his later and, in his own words (1976, p. 309), "more important work" from "its primordial obscurity". Overall, Jung's later work focuses primarily on translating the therapeutic oriented analytical psychology

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<sup>17</sup> Talking about the archetype Animus, for example, Jung stated that it was the deposit of "ancestral experiences of man-and not only that, he is also a creative and procreative being".

into the broader theory of complex psychology.<sup>18</sup> Atmanspacher (2006), Giegerich (2007), Robertson (1995), Shamdasani (2005), and von Franz (1974) are among those who have highlighted or expanded more specifically on Jung's later work. Beyond the number archetypes, Shamdasani points to topics in the lectures Jung gave at the Swiss Federal Institute for Technology (ETH) which highlights his shift in focus:

These lectures are Jung's most important series of lectures and the primary source for the understanding of his late work. The topics of the lectures include a seminal study of the history of psychology, an account of the theory and practice of complex psychology with particular reference to the theory of complexes, dream analysis, psychological types, and the psychology of the unconscious, Jung's most extended case study, studies of the spiritual exercises of Ignatius of Loyola, the Yoga sutras of Patanjali, and the symbolism of Buddhist meditational practices and medieval alchemy. . . . These lectures . . . provide the basis of his work in the 1940s and 1950s. (p. 10)

Both Giegerich and Robertson consider *Mysterium Coniunctionis* as the culmination of Jung's later work. They, like Atmanspacher, point to the key notion of oppositional structure in the (collective) psyche and the resulting dynamics. Specifically:

the terms separation and synthesis (or union) indicate the nature of this oppositional structure, namely that it is not really a "structure" at all . . . but rather a movement, a living tension (Giegerich, 2007, p. 250)

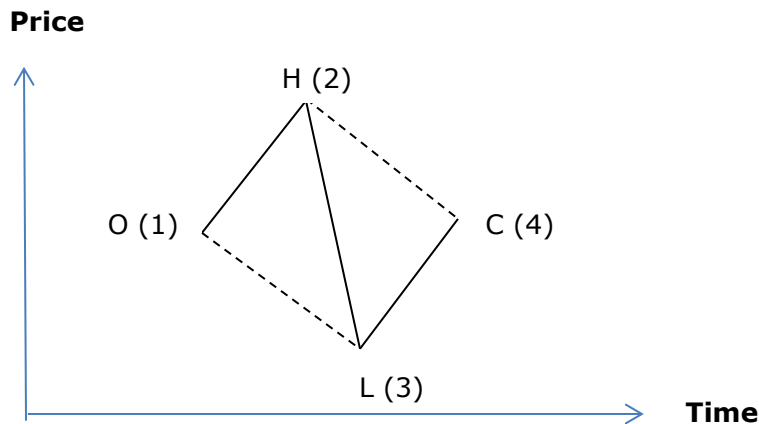
In this thesis, particularly in chapters 4 and 5, I clarify and emphasise the numerical essence of these dynamics. Starting with Jung's famous explanation of the relationships between the first four integers emerging from zero, the null, I explain why the numerical archetypes are the prime (as in irreducible, *unhintergehbare*) drivers in the complexity of mind. In terms of prices and their, often cyclical, movement in capital markets, the following graph of the core O (Open), H (High), L

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<sup>18</sup> Among his main inspirations for this attempt is, in my view, his friendship and cooperation with Wolfgang Pauli (see Miller, 2009). Specifically, Pauli (in Card & Morariu, 1998, p. A74) recognised the importance of number intuition as part of "a more general concept of archetype".



(Low), and C (Close) prices intuitively represents the link to Jung's 'original' integers, e.g. the Open (1) emerging from the "unknown" (0, i.e. zero) and the Close (4) completing a periodic cycle (or square via the dotted lines):<sup>19</sup>



By reducing periodic prices, i.e. time series, into these four elementary components the fractal nature of price patterns, among others, can be made much clearer. For example, one could analyse whether the relative distances between the weekly OHLC, in terms of size or duration, mirror those on a monthly scale, e.g. to confirm a trend.<sup>20</sup> I will discuss price patterns in more detail in chapter 8 where, for example, I will interpret Jung's "binarius" in terms of the most elementary of trends with an embedded oppositional, i.e. action-reaction, movement.

Unfortunately, Jung was not allowed more time to elaborate on his preliminary reflections on numbers so a lot of lifting remains to be done. Von Franz in particular provided early and more detailed explorations into the psychic nature of numbers in

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<sup>19</sup> To be clear, the sequence between the Open and Close can be different, e.g. time-wise the Low is reached before the High. The next cycle, via a new Open, starts from (although not necessarily at the same level as) the previous Close, i.e. from "what was concluded, so far".

<sup>20</sup> Fractals are also a popular topic for technical analysts who will prefer to compare time series that are derived from the Fibonacci sequence, i.e. 1, 2, 3, 5, 8, 13, etc. periods.

her seminal *Number and Time* (1974). For all the ground she covered by her work, however, she notes that one crucial empirical issue remains unaddressed:

If we apply these reflections of Jung to number, this would mean that number is bound up with the latent material aspect of the psyche and with the latent psychic aspect of matter. Up to the present time, however, *no means of measuring psychic intensities numerically has been envisaged*, although I believe such a possibility exists because of the fact . . . that all emotional, and therefore energy-laden, psychic processes evince a striking tendency to become *rhythmical*. (von Franz, 1974, p. 157; emphasis mine)

In this thesis I will argue that her search is over: the capital markets provide the means to measure psychic intensities numerically and collectively, namely via prices which evolve in rhythmical patterns. Price discovery performs the transcendent function by merging the physical worth with a psychic value, symbolically expressed by a number. A price is the number which reflects the temporary agreement between buyers and sellers of a security. Although a buyer and seller, almost by definition, disagree on value they both experience this shared moment of submission to price. Such a meeting of minds is a psychological event, leading to the physical exchange of money for the underlying security. Price discovery is the self-organising process in capital markets by which the mental domain of investing (e.g. fiat money) is bridged with the physical domain of the real economy (e.g. tangible assets). This process occurs on a massive scale, 24/7 across the globe. Although Jung himself only once made a specific reference to stock markets (see full quote below), he seemed aware of the general importance of economics to the broader society and specifically the role of psychology in markets. This becomes apparent, for example, in the correspondence with Eugen Böhler, a professor of economics at ETH whom Jung befriended (Jung and Böhler, 1996). Among the most significant topics in their correspondence are the role of myths in the sciences, e.g. economics, the polarity between (rational and emotional) forces, and the importance of individuation in

terms of the role of the individual within the collective, e.g. the state. Later Böhler expands on some of these in less personal and more economic terms. Particularly relevant in light of the extraordinary measures taken by governments and central banks since the credit crisis erupted with the Lehman collapse in 2008, and especially the debate surrounding inequality, is the following comment:

Once a certain optimum has been attained, guaranteeing man a dignified human existence, *any extension of government power weakens individual responsibility*. If a government were to attempt the elimination of all economic inequalities, it would have to interfere with the economy to such an extent as to render impossible the moral development of the individual . . . The individual has even less significance for the state than he has for the economy, because affairs of state are exclusively dominated by *raisons d'état*. . . . The influence of the individual — and thus of moral reflection and conscience — decreases as the power of collective interests increases, requiring a strengthening of central authority. Life becomes *ever more mechanical*. (1970, p. 63; emphasis mine)

Other Jungian analysts have also touched on the meaning of complex psychology in matters of economics and finance. For example, Hillman (1982) argues that money is “a deposit of mythical fantasies” and a “complex”. He also identified economics as the only “omnipotent God” that exists today. Samuels (1993) discusses the market economy in the broader context of depth psychology and politics. However, both do not reflect on the crucial role of capital markets in the modern global economy and specifically price discovery as its (self-)organising principle. Then there are researchers from other fields who use a Jungian approach in their work on economics and finance. Psychological types has been particularly fruitful in that regard and Van Tharp (undated), for example, has built a profiling method to help traders. In an interview he also expresses the relevance of dreams:

People tell me [they have dreams] all the time, especially top traders. For example, both the mechanical and intuitive super-traders that we talked about earlier expressed that they have had dreams about the market that were amazingly accurate. This

phenomenon may even occur more frequently than one might imagine—in symbolic form. However, I must admit that although it interests me, I have not investigated this area very extensively. (in Schwager, 1993, p. 204)

The sociologist Charles Smith, albeit not in terms of Jung's typology, identifies different types of market participants, i.e. the Fundamentalist, the Insider, the Cyclist Chartist, and the Trader. He refers to religion when he makes the distinction between "true believers" and other participants:

The true believers could be called the priests of the market insofar as they are spokesmen for the major market "religions". The market, however, is a secular place. True believers consequently are more likely to see themselves as prophets than priests; like the prophets of old, they see themselves as living among "pagans". Without the pagans, they would not be true believers. (1981, p. 65)

Finally, Smith hints he is at least aware of Jung when he rounds it off with stating that a truly-believing Trader is:

concerned with the life blood of the market, its essential energy. One could almost say that he's interested in the market's libido. (Ibid)

Linking insights from finance with those from mind sciences, in particular complex psychology, is mutually beneficial for both disciplines. Specifically in terms of philosophy, for example, modern science evolved despite fully addressing the mind-body problem which originated with two of its founders, Descartes and Mersenne. In the thesis I argue that this problem cannot be solved without inclusion of its collective dimension which is often so vividly demonstrated in markets. Within this dimension, researchers from Mackay (1841), via Keynes (1936), to Shiller (1984) have emphasised the role of mass psychology in markets. The latter, for example, stated that mass psychology may well be the dominant cause of movements in the price of the aggregate market (p. 458).

Therefore, the relevance of the topic of this thesis rests, first and foremost, on its premise: the market's mind, the manifestation of collective consciousness by capital markets. From this premise, the thesis further clarifies the unconscious origin, as well as the phenomenal culmination, of price discovery. Based on insights from complexity theory I explain why both (have to) escape axiomatic capture. I also emphasise the need for a different method of research, inspired by Jung's active imagination (e.g. Chodorow, 1997; von Franz, 1997), to complement traditional investment analysis. At the same time, this premise also points to the underlying issue of the market's mind-body problem. As I will argue, this issue is largely ignored in finance and no progress will be made, in terms of gaining a better understanding of markets, if this problem is not, at the very least, acknowledged. With globalisation, trade liberalisation, and financial innovation bringing a growing number of investors into the global financial system, more than ever a thorough understanding of their collective behaviour is required. Because time and time again, in dealing with uncertainty, it is the collective aspect which dominates market moves as investors are affected by mass psychology. The collective investor mind-set shifts from euphoria to despair, shared emotions drift from greed to fear, while the financial markets experience booms and busts. After the Asian currency crisis in 1996, the blow-up of Long Term Capital Management (LTCM) in 1998 (e.g. Lowenstein, 2001), and the dot-com bust in 2000, the recent crisis (generally known as the Great Recession or Credit Crunch; e.g. Lewis, 2011)<sup>21</sup> is the latest case in point where investors lose their minds at the peak of the bubble and their nerves at the bottom of the crash. What is striking about these swings in financial wealth and

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<sup>21</sup> In the following, the term "crisis" refers to the Great Recession or Credit Crunch, unless specified differently.

wellbeing is that they are remarkably similar over time. Financial history may not repeat itself exactly, but it clearly rhymes (e.g. Kindleberger and Aliber, 2011).

Finally, what is undeniable are the 'real' impacts of market dynamics on the broader society, varying from beneficial global trade and financial innovations to detrimental resource depletion and inequality. On that note, I do not want the reader to get the wrong impression from what follows. So, to be clear: I do not think markets are perfect. But, contrary to consensus, neither do I think that their flaws are inherent. Rather, I believe markets have become more imperfect due to the aforementioned incorrect ontology that leads to a shaky epistemology which, in turn, spawns practices, policies, and regulations that 'hurt' markets. In particular, as I will discuss in more detail below, the mechanical view of the market is based on finance's own version of physicalism and leads to a treatment of its mind that is deemed unhealthy (not only in complex psychology terms.) From a mind-body perspective I would go as far as to say that the current misdiagnosis and mistreatment of the market cause many of its flaws, like a doctor's misdiagnosis and mistreatment can cause damage to a patient. What we're dealing with in markets is the economic and collective variant of the eternal struggle to bridge the physical with the psychological. This has been the case ever since markets formed and can explain the recurring phenomena, e.g. of booms and busts, over the ages. Technology, computers and artificial intelligence (AI) in modern markets do not change that, for example. They simply raise the same questions as they do in the broader discussion within the mind sciences, e.g. concerning the mind-body problem. Assuming that "This time it's different" can be very expensive, as the late Sir John Templeton, founder of Templeton Investments, has pointed out. What is crucial is that not realising the essence of this struggle risks throwing the baby out with the bathwater. Worse, the

trend over the past few decades to an increasingly physical and mechanical economic worldview is a move to extremism. Not only does it depart from some fundamental human qualities, like emotions and empathy. It also makes a big ontological commitment that, at best, is ill founded and, at worst, potentially damaging. In the spirit of Sir John, it is a highly leveraged bet that could wipe you out. Hopefully it is (or at least becomes) clear that this perspective on the paradigm, addressing the true nature of markets as embedded in human nature (the good and the bad), is beyond discussions concerning capitalism versus communism, or Keynesian versus Austrian economics, or conservatism versus socialism, for example. Still, I accept that some will find this focus too limited or even wrong.

### 1.3 OVERVIEW LITERATURE

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Apart from complex psychology, other mind sciences like philosophy, evolutionary psychology and neuroscience provide many insights for this study, particularly concerning the ontological and epistemological aspects of the consciousness debate. For an introductory overview of this debate see Blackmore (2005). Arguments from physicalism (e.g. Dennett, 1998; Kim, 2005), phenomenology (e.g. Husserl, 1887), dual naturalism (e.g. Chalmers, 1996), reflexive monism (e.g. Velmans, 2008) in particular have helped to sharpen my philosophical arguments concerning the nature of the market's mind, for example in terms of the market's mind-body problem. Buss (1999) has provided an excellent, albeit technical, overview of evolutionary psychology. On that note, I am particularly fond of the writings of evolutionary psychologists Tooby and Cosmides because they have attempted early on (1994) to highlight its relevance for economics.

Numerous researchers have argued (implicitly or explicitly) that consciousness in general has indeed a collective dimension. Plato, Durkheim and Nietzsche<sup>22</sup>, while representing different view-points, argued in several of their writings for the collective aspect of consciousness, with Le Bon and Jung pointing to its unconscious origin. Contemporary researchers (e.g. Hut and Shepard, 1996; Surowiecki, 2004; Mathiesen, 2005) have followed up with similar arguments, as have neuroscientists (e.g. Edelman and Tononi, 2000). Mirror neurons play an important role in terms of the cerebral underpinnings of intersubjectivity and other manifestations of shared consciousness. Sources include Rizzolatti et al. (1996), and Gallese et al. (2007). Various topics like imitation (among the earliest sources being Tarde, 1903) are closely related to the dynamics involved.

More intriguingly, researchers in finance have hinted at the phenomenon of collective market mentality (e.g. Smith, 1981; Soros, 1987; Knorr Cetina and Bruegger, 2000). In particular, Sornette (2003) refers explicitly to the "emergence of consciousness" in capital markets. Shermer (2008) discusses the evolution of the "market's mind" and refers to its "archaic" origins. Apart from these references I argue that the premise of the market's mind is implied in any discussion on whether the market is rational or not (e.g. Rubinstein, 2001), let alone whether Mr. Market suffers from bipolar disorder (Cheung, 2010).

Although it is a fairly young discipline compared to some of the other sciences, finance has a rich history. For a non-technical overview see Bernstein (1992 and 1998). More technically oriented readers should refer to Rubinstein (2006). Those interested specifically in the Efficient Market Hypothesis (EMH) should read Fama

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<sup>22</sup> Nietzsche's observation that "Insanity in individuals is something rare - but in groups, parties, nations and epochs, it is the rule" (Beyond Good and Evil, 1886, Aphorism 156) is, for example, very appropriate in light of "market madness".



(1970), a seminal paper by one of its founders, and will find that Beechey et al. (2000) provide an excellent short survey. Behavioural finance has become a serious complementary (as well as challenging) branch to standard (or modern) finance. There are two main streams in behavioural finance. The first stream basically argues that heuristics (i.e. intuition) is detrimental to decision making. The other argues that heuristics are evolved psychological skills which can benefit decision making. Kahneman is advocate of the first stream and has collected its main insights into a seminal work (2011). Gigerenzer (2007) is the main supporter of the second stream and is, in his own words, Kahneman's harshest critic.<sup>23</sup> A source particularly aimed at practitioners is Montier (2007). Another branch relevant for this research is economic sociology and for an overview see Knorr Cetina and Preda (2005). Finally, although economics and finance are considered nested disciplines, I will not discuss the former in great detail here. Nevertheless, for a broad but thorough overview in the Rational Expectations Hypothesis (REH) tradition see Samuelson (1985), and for a critical assessment (also, by the way, of behavioural finance), see Frydman and Goldberg (2007). In addition, the emphasis on freedom of markets to set prices, i.e. to allow price discovery, makes the Austrian School of economics (e.g. Hayek, 1945, 1967, 1974; Mises, 1949) close in spirit to this thesis.

Returning to the topic of this thesis, despite many attempts to explain the repetitive patterns (e.g. momentum) in collective behaviour of investors, finance has been unable to provide a comprehensive hypothesis as to the underlying causes for this. Many others have criticised modern finance, varying from attacking the EMH (e.g.

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<sup>23</sup> Their dispute should be viewed in the broader debate concerning unconscious-thought advantage (UTA).

Haugen, 1995; Taleb, 2001; Derman, 2011)<sup>24</sup>, showing the limitations of the REH (e.g. Spear, 1989), to dismissing behavioural finance (e.g. Lucas, 2001)<sup>25</sup>. My criticism of modern finance in general and behavioural finance in particular is aimed at their exclusive focus on the cognitive dimension of human behaviour and the resulting dependence on analysis in terms of research method to understand markets. This study will, instead, argue that investing, first and foremost, is an experience. For example, the phenomenological or experiential dimension of what it 'feels like' to be in markets is crucial in exactly those situations when investors collectively lose their minds, and subsequently their nerves. And the related sense of a shift in sentiment for a crowded trade relies on intuition. On that note, in psychology in general and behavioural finance in particular, a distinction is made between the mind's "System 1" and "System 2". Both contain mental capabilities that often compete but also cooperate for the mind's attention. Personally I do not subscribe to the strict distinction that is generally applied but rather see the two systems as closely interacting within the broader complex adaptive (and reflexive) system we call mind. Still, this framework helps to clarify the various mental functions and how they compete/cooperate.

Below is an overview of some of the psychological functionality involved in both systems<sup>26</sup>:

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<sup>24</sup> Both Taleb and Derman are serious 'quants' but criticise the dominant practise of dogmatically applying mathematical models to markets which, they argue, are unpredictable and (very much in the spirit of Hayek) of which we have incomplete knowledge.

<sup>25</sup> Lucas points out that stream one implies that investors systematically disregard information in their forecasting errors, something that makes this the "wrong theory".

<sup>26</sup> See Kahneman (2011), as well as Epstein (1994).

<b><i>Unconscious, experiential system 1</i></b>	<b><i>Conscious, rational system 2</i></b>
<ul style="list-style-type: none"> <li>- Unconscious reasoning</li> <li>- Holistic assessment</li> <li>- Judgments based on intuition</li> <li>- Processes information quickly</li> <li>- Hypothetical reasoning</li> <li>- Large capacity</li> <li>- Prominent in animals and humans</li> <li>- Unrelated to working memory</li> <li>- Operates effortlessly and automatically</li> <li>- Unintentional thinking</li> <li>- Influenced by experiences/emotions/ memories</li> <li>- Prominent since human origins (innate)</li> <li>- Includes recognition, perception, orientation</li> </ul>	<ul style="list-style-type: none"> <li>- Conscious reasoning</li> <li>- Analytic assessment</li> <li>- Judgments based on critical examination</li> <li>- Processes information slowly</li> <li>- Logical reasoning</li> <li>- Small capacity</li> <li>- Prominent only in humans</li> <li>- Related to working memory</li> <li>- Operates with effort and control</li> <li>- Intentional thinking</li> <li>- Influenced by facts/ logic/ evidence</li> <li>- Developed over time</li> <li>- Includes rule following, comparisons, weighing</li> </ul>

A problem with all current investment approaches is their overreliance on (cognitive) analysis which supports the mind's System 2 capabilities. They largely ignore the fact that our consciousness is completed (in terms of how experiences are conveyed) by mental dynamics which (have to) escape axiomatic capture. I argue that in order for the economy's innovations and the related market prices to remain discoveries it is no wonder that the unconscious origin and phenomenal culmination of mental discoveries, e.g. intuitive insights, remain hidden from mechanical approaches.

To increase our understanding of the market's mind requires an investment research method attuned to these psychological dynamics, particularly considering the market's "big data". To put it in practical terms, Excel simply won't do. To complement analytical methods we need a systematic approach to support System 1 capabilities. In terms of where most of these are located in the brain, McGilchrist states that "the right hemisphere has no voice" (2011). I thus suggest a research method which applies and adjusts Jung's active imagination for an investment setting. By way of an audiovisual representation of market data an appeal is made to the mind's sensational capabilities in general, and intuition in particular, to understand the market's rhythmical numerical dynamics in a non-analytical sense. So, in addition to the theoretical hypothesis of numerical archetypes, this practical method sets complex psychology apart from other mind sciences in terms of how to counter the over-rationalisation promoted by modern finance and its obsession with physics. In chapter 10 I will discuss a framework for a proposed experiment where this is applied to test various sub-hypotheses.

The "dismal science" has also failed to recognise the importance of the (collective) unconscious affects, e.g. emotions, in price discovery. Recent scholarly studies include papers by Bechara and Damasio (2005), and Fenton-O'Creevy et al. (2011), as well as books (e.g. Damasio, 2000; Gigerenzer, 2007). These affects emerge in various forms and Loewenstein and O'Donoghue (2004), for example, refer to Keynes (1936) who coined them "animal spirits"<sup>27</sup>. Although Keynes emphasised their positive, stimulating effects we should remember that originally animal spirits had a more ambiguous meaning: they can guide, but also often haunt the market's mind (e.g. Descartes' "devils"). And it was Graham (1973), mentor of Warren

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<sup>27</sup> For another modern interpretation see Akerloff and Shiller, 2009.

Buffett, who pointed out that, as a result, "Mr Market" seems to suffer euphoria (mania) and despair (depression) on a regular basis. Consistent with Graham, this thesis will argue that 'the market' is indeed an entity, but an entity that is not separate from us. Nevertheless, its identity remains largely unknown, and its workings hidden, as in Adam Smith's "Invisible Hand" (1776; see also Tooby and Cosmides, 1994 [full quote in section 6.4]). In complex psychology terms, Mr Market is the personification<sup>28</sup> of the market, particularly its collective psychic contents, including complexes. Mr Market's personality is primarily expressed and conveyed by way of prices. In finance terms price patterns reflect his reaction to (i.e. discounting of) news and events, but in complex psychology they could be interpreted as the 'dramatization' of numbers. We can subsequently speculate, for example, to which extent manipulation of his price discovery affects Mr Market's autonomy. Also, although Mr Market is gender-neutral (despite his name), certain behavioural characteristics or moods could possibly be identified and interpreted as masculine or feminine, but this falls outside the scope of this thesis.

This thesis will explain the market's mind in terms of a collective consciousness focused on price discovery. The latter involves insights into the meaning of (numerical) symbols, namely prices. Those insights emerge from the interactive dynamics between the unconscious, cognitive and phenomenal domains of investors' minds, both at the individual and collective level. The relevance of Jung, who popularised the collective unconscious and developed the archetypal hypothesis, should be obvious (again, see specifically von Franz [1974] and Robertson [1995]). Still, although his theory plays a central role I will not discuss the person Jung, as he is not part of the theme of my thesis. Nor will I discuss his scientific or social

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<sup>28</sup> A classic reference in this respect is the first chapter in Hillman (1975, pp. 1-51), "Personifying or imagining things".

contributions. On these topics many others have written volumes, from critical (e.g. Noll, 1994), via balanced (e.g. Bair, 2003) to admiring (e.g. Shamdasani, 2003). Instead, I will introduce and explain concepts developed by Jung, which I deem relevant for finance, and which subsequently I have adapted to specifically fit the finance setting. This is perfectly in accordance with the spirit of Jung's theory:

the archetypal concept is so fundamental that it is being taken out of the hands of Jungians and its implications are being worked out by practitioners in other disciplines. This is as it should be, for Jung never argued that his psychology was definitive or final. The full implications of archetypal theory have yet to be realized. (Stevens, 2002, p.88)

As aforementioned this thesis focuses on Jung's later and, in his own words, "more important" work. Arguably, Jung became more of a philosopher/theorist and less of a psychologist/therapist during his later years. Consequently, in his later work "he simply expresses the abstract notion of the oppositional structure or form of the psychic" (Giegerich, 2007, p. 249). Giegerich refers to Jung's interpretation of the dual aspects of mind.

Jung preferred the term complex psychology rather than analytical psychology. The oppositional structure of the mind as well as concepts like complementarity are closely associated with complex dynamics (to be discussed in the next section). More broadly, chaos and complexity are dealt with by Gleick (1987) and Mitchell (2009). Complexity theory applied to economics has been discussed by Arthur et al. (1997) and Markose (2005). Finally, topics like Gödel's theorems (e.g. Penrose, 1994) and algorithmic information theory (e.g. Chaitin, 1987) will be discussed because they help to formalise some of the arguments concerning complexity, like completeness and consistency.

Finally, Jung's later work culminated in his conclusion that the numerical archetypes form the core or prime archetypes. I link numerical archetypes to its modern variant, called number sense, with the main sources being Dehaene (e.g. 1997), and Butterworth (1999).<sup>29</sup> Apart from the original Greeks, early reflections on the philosophy of mathematics and/or mathematical philosophy include Edgeworth (1881), Frege (1884) and Russell (1919). Early sources on specifically number (intuition) include Danzig (1930), and Hadamard (1945). All provide more mathematical details and background to the Jungian reflections by von Franz and others on numbers.

#### 1.4 THEORETICAL CONTEXT

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Some of Jung's work deals with the mystical aspects of the mind. There are various alternative interpretations of this. For example, perennial wisdom, a term first coined by Aldous Huxley, signifies the common characteristics of philosophy and the various mystical traditions which have provided so many insights into the nature of mind. Although one could debate whether these interpretations remain valid in modern times, fact is that scientists

are starting to acknowledge that they might have something to learn from ancient contemplative disciplines. Students of neuroscience are now reading the teachings of Buddha alongside the works of William James; researchers toil up Tibetan mountains to interview members of isolated religious communities about their perceptions of time and space; and bemused (or perhaps amused) monks are regularly invited to meditate with their heads in brain scanners. (Carter, 2002, p.277)

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<sup>29</sup> Earlier reflections (not always in agreement) include, for example, Karmiloff-Smith (1995).

All this will be dealt with in a broader framework. The conceptual framework for the thesis' approach to analyse the markets' consciousness is based on complexity theory, in particular that of complex, self-organising (or adaptive) systems. As aforementioned, the contribution by Jung to clarify the mind as a complex system bridging the phenomenal (and spiritual) with the physical was acknowledged, for example, by Capra. Complexity theory<sup>30</sup> has gained prominence over the past few decades at the expense of reductionism exactly because the latter is based on a mechanical perspective which is limited in explaining non-linear phenomena like novelty, i.e. surprises. Specifically it fails to explain how a complex adaptive system endogenously produces the internal surprises (e.g. the mind's insights) required to deal with external ones. Moreover, the overreliance on mechanical, particularly quantitative, methods of investing has contributed to some of the issues that have characterised the crisis and its aftermath. For all clarity, I am not arguing that there are no mechanical processes operating in human mentality. Rather, I am arguing that human mentality is not exclusively mechanical and that relying on the assumption that they are, with the accompanying faith in economic/financial engineering, can lead to unintended consequences.

In short, this thesis makes references to multiple disciplines, among others, finance, biology, mathematics, philosophy, psychology, physics, and sociology. Therefore, some basic knowledge of these disciplines as well as familiarity with cognitive/consciousness research is helpful in understanding the concepts discussed in this thesis. I hope the earlier sections in this chapter have been helpful in that respect. Also, I have tried to explain them as much as possible in non-technical terms in the remainder of this document. Again, in order to present my thesis in a

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<sup>30</sup> Also known as (dynamic) systems theory.



proper format, I've selected the scientific and philosophical concepts related to mind and consciousness which I deem appropriate and most fitting to the financial setting. That selection is therefore subjective and far from exhaustive<sup>31</sup>. I certainly do not pretend that my reasoning answers all questions on consciousness in the markets. Far from it: consistent with my hypothesis certain questions will always remain unanswered. All I can hope for is that it will trigger further discussion and research along these lines.

In terms of finance, the topic of the thesis clearly goes beyond finance's usual boundaries. Whereas modern finance and its EMH view markets mechanically, i.e. from a machine perspective, this thesis finds inspiration in sources that deal with evolution of mind<sup>32</sup>. Consequently, this thesis will take the reader beyond the well-known anomalies described by behavioural finance. It will also surpass other publications which focus on the individual investor mind, because it will explore the depths of our collective mind, of which the individual mind is only a part and often a slave. In any case, the terms in which I describe the financial markets are undoubtedly blasphemous for most finance academics, but hopefully more attuned to my broader audience.

Part of my motivation to write this thesis rests on the conviction that the financial system has something to teach the sciences, in particular those involved in consciousness research. Finance has historically borrowed ideas and concepts from the 'hard' sciences, in particular physics, but this has resulted in a restrictive paradigm, a tunnel vision. Moreover, it never realised it had this treasure trove to

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<sup>31</sup> In fact, what is generally known as "the philosophy of mind" offers a rich source of fascinating insights to any investor who's interested in the essence of consciousness. Again, I had to be selective.

<sup>32</sup> For example, it pays allegiance to but also differs from the Adaptive Market Hypothesis, a convincing alternative to the EMH based on evolution and introduced by MIT finance professor Andrew Lo (2004).

offer to other disciplines, in the form of long histories of 'highly emotionally charged' data on interacting minds. Also, in the spirit of both the critical *Freakonomics* (Levitt and Dubner, 2005), and the praising *Freedomnomics* (Lott, 2007), I'd like to clarify the role of capital markets in modern society, and more specifically convey the fascinating world of collective investment psychology. For those readers who like psychology, but never cared much about the markets, I let Jung make my point:

Anyone who wants to know the human psyche will learn next to nothing from experimental psychology. He would be better advised to abandon exact science, put away his scholar's gown, bid farewell to his study, and wander with human heart through the world. There in . . . the *Stock Exchanges* [among other worldly places] . . . through love and hate, through the experience of passion in every form in his own body, he would reap richer stores of knowledge than text-books a foot thick could give him, and he will know . . . with a real knowledge . . . the human soul. (1912, p. 247; emphasis mine)

I am also motivated to help the individual investor by introducing a new methodology of investment research that focuses on the audiovisualisation of market data.<sup>33</sup> Although reflecting different approaches and emphasis compared to mine, other research on this topic includes Nesbitt and Barass (2004), and Bettner et al. (2010), as well as references therein.

Another part of my motivation comes from the need, as I perceive it, to explain the financial system to some of its harshest critics. Apart from a roster of politicians, among those are members of, what has been labelled as, the anti-capitalist and anti-globalisation movement. They view the capital markets as part of the 'problem' in modern society, in particular as far as inequality, globalisation and climate change are concerned. After reading this thesis, they hopefully will realise that capital markets are not the easy scapegoat. In a number of non-technical articles (syndicated [here](#), for example), I address more specifically some of the issues they

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<sup>33</sup> It is a practical application of what I call Archetypal Valuation (chapter 9).

raise and argue that, instead, the financial system is our biggest hope for peace, prosperity, and sustainability if allowed proper 'freedom'. In the words of Markowitz (1991), echoing Smith, Hayek, and others:

My own views are much closer to the gospel according to Adam Smith. The invisible hand is clumsy, heartless, and unfair, but it is ever so much more deft and impartial than a central planning committee.

At the same time, I hope to clarify my earlier statement that, while the ivory tower of EMH is being shot to pieces, the early foundations for an alternative structure are being built on shaky grounds. Its architects have been ignoring the underlying cave upon which these foundations are being built, i.e. the unconscious. Overall, I provide an implicit warning that the crisis, which arguably peaked after the Lehman collapse in 2008 but has lingering effects (e.g. dread risk; Haldane, 2015), will be repeated in much more serious forms. That is, unless we start to acknowledge the importance of, what Greenspan (2008)<sup>34</sup> has called the "innate human responses" in speculation, and to place these in their proper framework. That framework is the collective unconscious which attempts to compensate, via the numerical archetypes, human imbalances which, in our global society, are reflected in market excesses.

With this theoretical framework I hope to answer questions which have steered me over the years to write this thesis. They certainly have not been answered satisfactorily (or not at all) by mainstream finance:

- Why are prices consistently the variables which explain best their own variance (e.g. momentum; e.g. Elroy Dimson, et al., 2008)?

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<sup>34</sup> In what some consider one of a series of 'confessions' of his errors.

- Why have capital markets become so dominant over the 'real' economy, increasingly at a global scale (e.g. "the tail wagging the dog", the fears of both Minsky and Keynes; see, for example, John Bogle, 2008)?
- Why has economic evaluation encroached so far in modern society, attaching monetary value to education, art, the weather, and even life and death (e.g. Capra, 2002)?
- Why have academics behaved irrationally in their field, while insisting on the rationality of investors in the market (e.g. Krugman, 2009)?
- Why have investors not learned, or rather seem to forget quickly what they've learned, from previous financial crises?<sup>35</sup>
- And why do these crises seem to have become worse to the point of financial Armageddon?

In conclusion, throughout this thesis, sometimes in dedicated sections, I will emphasise the primacy of numerical archetypes for the investment experience. If there is one message this thesis is attempting to bring across it is the following:

**Price discovery bridges the physical real economy with the mental markets thereby bringing order to the modern global society. It provides the numerical measuring for the collective mind's intensities, as searched for by many Jungians, captured in the earlier words of von Franz. Combined with the neuroscientific insights into the assignment by emotions of values to situations, this is why I argue that prices embody an emotional charge, and**

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<sup>35</sup> E.g. when he was asked what people would learn from the whole financial crisis, investment guru Jeremy Grantham said, "In the short term a lot, in the medium term a little, in the long term, nothing at all . . ." (<http://www.ritholtz.com/blog/2014/02/grantham-people-dont-learn/> , downloaded 23/06/2014).

**by themselves possess the potential to trigger instinctive behaviour, independent of fundamentals. In other words, to paraphrase von Franz, it is not what we can do with prices, but what they do to our consciousness that is essential in our understanding of markets.**

Finally, capital markets evolved despite of us, not because of us, guided by a familiar but unknown invisible hand. There is a reason why we, now on a massive global scale, ended up with ordering our affairs by way of price discovery. True discovery is a delicate and often painful process with its own, largely hidden, dynamics.

Interference, particularly of the 'politically correct' kind, not only distorts prices but, as Böhler pointed out, weakens individual responsibility. Other forms of manipulation, like the recent Libor and Forex rigging scandals or pre-release inside information<sup>36</sup>, have similar detrimental effects.

## 1.5 OVERVIEW CHAPTERS

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Again acknowledging that the multi-disciplinary nature of my thesis forces me to be selective, which leads to both losses and gains for all categories of readers, the remainder of this thesis is divided as follows.

Chapter 2 will discuss the urge to search for a new paradigm in finance following the crisis. The emphasis is on the ontological nature of markets and related issues.

Chapter 3 will introduce Jung's concepts of the unconscious in general and archetypes in particular. This is followed in chapter 4 by an overview and interpretation of consciousness. Chapter 5 returns to archetypes, but specifically the

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<sup>36</sup> See, for example, <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1901.en.pdf?ca0947cb7c6358aed9180ca2976160bf>.

numerical archetypes and how this relates to the modern concept of number sense as well as to price discovery. These chapters prepare the ground for framing the working hypothesis of this thesis in chapter 6 which includes phrasing the market's mind-body problem. Chapter 7 delves into mass psychology by linking Jung's concept of participation mystique to mirror neurons. Chapter 8 provides more detail on (the symbolic nature of) prices, their patterns and their discovery. Chapter 9 introduces a portfolio management perspective on mentality, called Archetypal Valuation. It provides a philosophical backdrop for Audio Visual Investment Research (AVIR), a new investment research method I am developing. The latter is the topic of chapter 10 where I suggest a propositional framework for an experiment which could tests some of the sub-hypotheses presented in this thesis. I finish this thesis with some concluding remarks in chapter 11.

The remainder of this document also contain a number of boxed sections, called "notes", that clarify topics from an investor's, Jungian, or general perspective.

Finally, a list of references completes this document.

## CHAPTER 2. FINANCE AND ONTOLOGY<sup>37</sup>

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*There is no reason (except a mistaken physical determinism) why mental states and physical states should not interact. (The old argument that things so different could not interact was based on a theory of causation which has long been superseded.) If we act through being influenced by the grasp of an abstract relationship, we initiate physical causal chains which have no sufficient physical causal antecedents. We are then 'first movers', or creators of a physical 'causal chain'.*

*Karl Popper*

*Psyche cannot be totally different from matter, for how otherwise could it move matter? And matter cannot be alien to psyche, for how else could matter produce psyche? Psyche and matter exist in one and the same world, and each partakes of the other . . .*

*Carl Jung*

### 2.1 INTRODUCTION

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Unprecedented times ask for unprecedented thinking. Parallel to recent (and in some instances on-going) economic turbulence, which culminated in the crisis, questions have again been raised about the underlying theoretical framework, or paradigm, with which we view and analyse the economy in general and capital markets in particular. Apart from Queen Elisabeth who, in 2009, famously wondered why no economist saw the crisis coming, German Chancellor Angela Merkel (2009) summed up the disappointment with current as well as the need for new thinking:

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<sup>37</sup> This chapter is an adapted version of my paper "Mr Market's Mind: Finance's Hard Problem" (Schotanus, 2014).

Moreover, and this is directed at the economic sciences, one must honestly confess that the sciences have not sufficiently recognized this problem. We often give great credence to prognoses. Yet the prognoses that were made did not serve as an early warning of such a crisis. That is why research on the mechanisms of the international financial markets will certainly have to be intensified.

The term paradigm was popularised by Kuhn (1962) who described the process in the advances of the sciences by way of paradigm-shifts, non-linear and radical departures from previously held belief-systems to new worldviews. Many agree that finance is experiencing a similar shift, with some in academia arguing that it is about time. For example, the London School of Economics, in cooperation with other institutions, formed the Future of Finance Group. Their findings were published in a report called "The Future of Finance; And the Theory That Underpins It". George Soros has even gone so far as to establish the Institute of New Economic Thinking (INET) with the aim to "find a new paradigm to rebuild from the ground up."<sup>38</sup>

What is undeniable is that the current dominant paradigm, generally known as modern finance, is now being challenged by a number of alternative theories. Prime among these is behavioural finance which has identified various anomalies which cannot be explained by modern finance. However, we need to go beyond anomalies in order to better understand both its shortcomings as well as the requirements for an emerging new paradigm. In our search we can find inspiration from Pauli's view:

I hope that no one still maintains that theories are deduced by strict logical conclusions from laboratory-books . . . Theories are established through an understanding inspired by empirical material, an understanding which is best construed, following Plato, as an emerging correspondence of internal images and external objects and their behaviour. The *possibility of understanding* demonstrates again the *presence of typical dispositions* regulating both inner and outer conditions of human beings. (in Atmanspacher and Primas, 2006, p.10; emphasis mine)

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<sup>38</sup> I was kindly invited to attend INET's first three conferences, including the inaugural conference at Cambridge University in April 2010.



What is required are both a revised ontological premise as well as complementary epistemological assumptions. In short, we need to revisit what the true nature of the market is, as well as what it means to participate in it. This chapter discusses the metaphysical foundations upon which modern finance rests and why these are shaky.<sup>39</sup> Among others I make the argument that modern finance represses the mind-body problem<sup>40</sup> of the market which is the primary cause for its shortcomings as well as those of its followers in the market.

## 2.2 CURRENT PARADIGM: MODERN FINANCE

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The framework of modern finance is built around the academic 'ivory tower' of the Efficient Market Hypothesis (EMH). The latter was developed in the 1960's, based on research by early explorers like Louis Bachelier, Alfred Cowles, and Maurice Kendall.<sup>41</sup> According to the EMH investors are rational in their pursuit to maximise wealth. In addition, markets are, to the extent of the accepted strength of the hypothesis, efficient in that prices reflect all available information. This basically means that investors should not expect to earn abnormal returns (other than by chance), i.e. 'beating the market' is nearly impossible and there are no 'free lunches'. Fama (1970) makes the following distinction:

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<sup>39</sup> To be clear, the term metaphysical refers to the ontological and epistemological assumptions underlying all of a theory's findings and hypotheses, in this case modern finance. It should therefore not be confused with metaphysics in a religious or spiritual sense.

<sup>40</sup> Also known as the mind-matter or mind-brain problem.

<sup>41</sup> For excellent historic overviews of modern finance, see Bernstein (1992), Rubenstein (2006) and Ferguson (2009). For a particularly critical view see Fox (2009).

<b>Strength of efficiency</b>	<b>Type of information reflected in prices</b>
Weak	Historic prices
Semi strong	Public information, historic prices
Strong	Private and public information, historic prices

According to the EMH, price discovery under these circumstances is limited to exploiting the discrepancy between the market value, or price, and the intrinsic value of a security by alert investors. This discrepancy is only a short-term inefficiency because its discovery will trigger trades leading to a close-to-instant re-pricing which will return the price to its intrinsic value, thus reaching equilibrium. In short, the price is almost constantly reflecting the intrinsic value.

Among the characteristics of modern finance is its reliance on mathematics. This is reflected in the three (overlapping) manifestations of modern finance in today's investment world:

1. Quantitative analysis: involves the application of mathematics in designing financial models (e.g. Capital Asset Pricing Model [CAPM], Black-Scholes options model);
2. Financial engineering: involves the application of mathematics in designing financial products (e.g. derivatives, Over-The-Counter [OTC] structured products);

3. Systematic investing: involves the application of mathematics in designing the investment process (e.g. mechanical/algorithmic/high-frequency trading, risk management).

But like the Sirens, the aesthetic appeal of mathematical models can be deceiving when using them as a compass. As Montier points out: "In finance we seem to have a chronic love affair with elegant theories. Our faculties for critical thinking seem to have been overcome by the seductive power of mathematical beauty" (2009, p. 6).

The inconsistency of current practice, and its implicit risk, was highlighted by

Woolley:

Most investors accept that markets are, to a greater or lesser degree, inefficient and devote themselves to exploiting the opportunities on offer. But by a nice irony, they have continued to use tools and adopt policies constructed on the assumptions of efficiency. It is a costly mistake. (2010, p. 137)

#### **Investment Note: CAPM**

The Capital Asset Pricing Model (CAPM) is the cornerstone model based on the EMH. It provides a framework to describe (expected) risk and return and draws conclusions, among others, on the efficiency of portfolios, including the market portfolio.

Although it remains central to the basic mean-variance optimisation of portfolios, it exemplifies the erroneous assumptions underlying modern finance and the empirical implications which follow from this. Specifically:

1. The CAPM is not logical, let alone realistic in its assumptions. In particular the assumption of being able to borrow limitless is flawed. Specifically, if "investors have limited borrowing capacity, then it no longer follows that the market portfolio is efficient." (Markowitz, 2005, p. 17)
2. The CAPM is not tractable, nor testable. In particular "the market" as a portfolio cannot be observed (i.e. Roll's second critique, 1977).
3. The CAPM is not empirical because we cannot make any statements due to the failure of both 1 and 2.

Finally, it is generally acknowledged that modern finance has been inspired by the natural sciences, in particular physics. That inspiration has been perceived as bordering on the obsessive. Soros, referring to Freud, has argued that modern finance suffers from a psychological disorder known as "physics envy" (2010, p. 21). Preferring Jung's terminology, I like to call it a "physics complex"<sup>42</sup>. There are certain complications attached to this disorder which I will highlight next by placing modern finance in a broader context, namely the underpinnings of modern science itself.

### 2.3 MODERN SCIENCE AND ITS PREMISE

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Modern science originated roughly in the seventeenth century, exemplified by the dualistic philosophy of Descartes and Mersenne. Harman (1994, p. 8) lists the main metaphysical assumptions which subsequently became the intrinsic premise of modern science:

- Objectivism: the assumption of an objective world which the observer can hold at a distance and study isolated from himself;
- Positivism: the assumption that the real world is what is physically and independently measurable;
- Reductionism: the assumption that we come to really understand a phenomenon through studying the behaviour of its elementary parts.

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<sup>42</sup> In Jungian terms, a complex is a distorted archetypal image, mainly due to repression. As I will argue, finance's complex is caused by the repression of the market's mind-body problem, particularly its phenomenal aspect, thereby not acknowledging the true nature of capital markets nor what it means to participate in it, i.e. have skin in the game.

The central characteristic of this premise is separateness, in particular the separation of observer and observed, subjective from objective, cause from effect and, in the broader context of this debate, the psychic from the physical. Apart from other 'conflicts', a theme I will return to later, ultimately this has led to the mind-body problem whereby "consciousness became essentially absent from the scientific worldview" (Ibid, p. 10).

According to Harman the above assumptions form an interrelated theoretical network from which, among others, expectations can be derived. Consequently:

When there is an "anomaly", or a failure of observations to confirm to scientific expectations, it means that somewhere in that network there is a falsity. But there is no standard logic for discerning just where in the theoretical network the falsity lies. Thus in the face of an anomaly we must consider revising all elements of the network. . . . In short, when experience contradicts science, the science must change, but there is no infallible logic for determining exactly what to change in one's theory. Karl Popper's insistence that theories are never proved, but only falsified or not, seemed at one point an important insight; however, in today's science to talk about "verification" or "falsification" of theory sounds naïve and simplistic. (Ibid, p. 7)

Acknowledging this complication we must accept that the adaptation of any theory, particularly those in the social sciences, goes beyond the idea that we use some 'ideal' experiment to either verify or falsify particular scientific hypotheses<sup>43</sup>. Rather there are basically two ways in which theories transform. The first way is via relatively small anomalies which simply pile up, initially slowly but often turning into a cascade. In that case, anomalies act like viruses in that they multiply and start to infect the whole structure, whereby a theory's death, to paraphrase Max Planck,

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<sup>43</sup> If only because an experiment is always part of contemporary human knowledge, in this case methodology design, and this already runs the risk of 'filtering' anomalies. This echoes the argument made by Strong Sociology, the largely Edinburgh-based school of thought, which proposes that both 'true' and 'false' scientific theories should be treated the same way. Both are caused by social factors or conditions, such as cultural context and self-interest. According to this school, all human knowledge, as something that exists in the human cognition, must contain some social components in its formation process.

“advances one virus at the time”. The second way, closer in spirit to Kuhn, is more radical and is caused by those anomalies which are so surreal that they defy ‘reality’: they become reality checks of ontological commitments. In that case, the implication is that:

even our epistemological convictions about how we acquire knowledge, and about the nature of explanation, justification, and confirmation, are subject to revision and correction. (Ibid, p. 7)

This has actually already occurred to some extent in the mind sciences. According to Roger Sperry, who received the Nobel prize in medicine for his research on split-brains, a cognitive revolution started in the 1970’s involving a turnabout in the conception and treatment of the conscious mind which “has vastly transformed previous scientific descriptions of ourselves and the world” (Sperry, 1994, p. 99).<sup>44</sup> The resulting shift away from the blank slate approach of behaviourism has recently accelerated with findings in fields like neuroscience (e.g. emotions<sup>45</sup>, Damasio, 1994; mirror neurons, Gallese, 2001; re-entry loop, Edelman and Tononi, 2000), consciousness studies (e.g. “the hard problem”, Chalmers, 1995; phenomenal consciousness, Ned Block, 1995; Blackmore, 2005), and (evolutionary) psychology (e.g. gut feelings, Gigerenzer, 2007; instincts, Tooby and Cosmides, 2005). Specifically, the common thread of these findings is an interaction between innateness and development of psychological functions, particularly emotions, suggesting the complementarity of nature and nurture. Crucially, the influence of the unconscious is acknowledged (e.g. Mlodinow, 2012). The particular implications for

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<sup>44</sup> As an aside, the irony of the simultaneous emergence of modern finance and behavioural finance (i.e. Kahneman & Tversky’s “Heuristics and Biases” program) around the same time should not escape the reader.

<sup>45</sup> Emotions involve mostly the feelings associated with experiences, compared to thoughts. The literature shows many variations to this distinction (for an overview, see Loewenstein and O’Donoghue, 2004).

finance as a theory, as well as prices as its unit of research, are captured by the words of Pauli, stating that if:

all understanding is a long-drawn-out process initiated by processes in the unconscious long before the content of consciousness can be *rationally formulated*, it has directed attention again to the preconscious, archaic level of cognition. On this level the place of clear concepts is taken by *images with strong emotional content*, not thought out but beheld, as it were, while being painted. Inasmuch as these images are an "expression of a dimly suspected but still unknown state of affairs", they can also be termed *symbolic*, in accordance with the definition of the symbol proposed by C. G. Jung. (1948, p. 2; emphasis mine)

The archetypal hypothesis can help us, for example, to specify Greenspan's "missing explanatory variable" in finance, namely "the innate human responses that result in swings between euphoria and fear that repeat themselves generation after generation with little evidence of a learning curve" (2008).

In fairness, the strict interpretation of the aforementioned assumptions started to be challenged much earlier by the findings in quantum physics (e.g. Heisenberg's uncertainty principle), followed by the implications from complexity (e.g. chaos) theory. The effect quantum physics had on Einstein, for example, underlines the experiential impact of this kind of reality check:

It was as if the ground had been pulled from under one, with no firm foundation to be seen anywhere, upon which one could have built.

Why does this sound so familiar to investors, particularly those relying on modern finance for explanations for the market's behaviour surrounding the Lehman collapse, for example?

## 2.4 FROM SEPARATENESS TO COMPLEMENTARITY

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I would argue that the turmoil in the capital markets, at the time of the Lehman collapse, qualifies for such a reality check in finance. Although this is often difficult to grasp for non-investment professionals, we came very close to a financial Armageddon. It would have meant, to borrow a line from the rock band REM, the end of the world as we know it<sup>46</sup>. In addition to this reality check, anomalies, identified by behavioural finance, had already been piling up for modern finance for longer. It is vulnerable to behavioural criticism because modern finance has not joined Sperry's cognitive revolution. Specifically, its premise embeds the reductionist assumption that price discovery, enacted by trading, can be separated from supplementary developments in markets, in particular mood shifts. In other words, it assumes that equilibrium is an independent mechanical process driven by the steady state of rationality. This insistence by modern finance on separation is quite broad (e.g. the market from its participants, theory from practice, and rationality from emotions) and is at the core of its own identity crisis, as well as that of the market.

#### **Side Note**

Following Tarnas (1991; quoted in Harman, 1994), let me clarify this via the double bind concept of anthropologist Gregory Bateson as applied to Benjamin Graham's schizophrenic Mr Market. I will analyse this by interpreting the relationship between a typical investor and Mr Market according to mainstream finance along Bateson's criteria:

**Dependency:** the investor's relationship to the market is one of economic survival, thereby making it critical for her to assess the nature of the market accurately, i.e. she needs to be engaged, or at least be aware;

**Communication:** finance theory prescribes how the market communicates, and its models suggest how information should be interpreted. However, the investor's mind

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<sup>46</sup> Should the financial system collapse, all financial transactions would cease, as would eventually the exchanges of goods. For example, ATMs would not provide cash anymore, shelves in supermarkets would become empty, and electricity would be shut down. An orderly society would revert to chaos, a new reality, a new world. In a BBC interview, former Chancellor of the Exchequer Alistair Darling describes how close the UK came to this ([http://news.bbc.co.uk/today/hi/today/newsid\\_8914000/8914062.stm](http://news.bbc.co.uk/today/hi/today/newsid_8914000/8914062.stm)). More recently former US Treasury Secretary Hank Paulson also admitted as much as far as the world overall is concerned.



receives mixed messages: contradictory or incompatible information about the situation in the market as experienced. In particular, its interiority by way of inner qualitative sensations is incoherent with the prescribed scientific impressions (e.g. model readings) of the market as its exteriority. Specifically, the mixed messages consist of the following:

- Modern finance (i.e. EMH): The market is efficient, so the price communicates nothing but rational behaviour. Irrational exuberance does not exist (because collectively we are all rational);
- Behavioural finance: The market is anomalous, so the price communicates systematic non-rational heuristics and biases, particularly emotions. Irrational exuberance exists (we all suffer from emotions, particularly collectively).

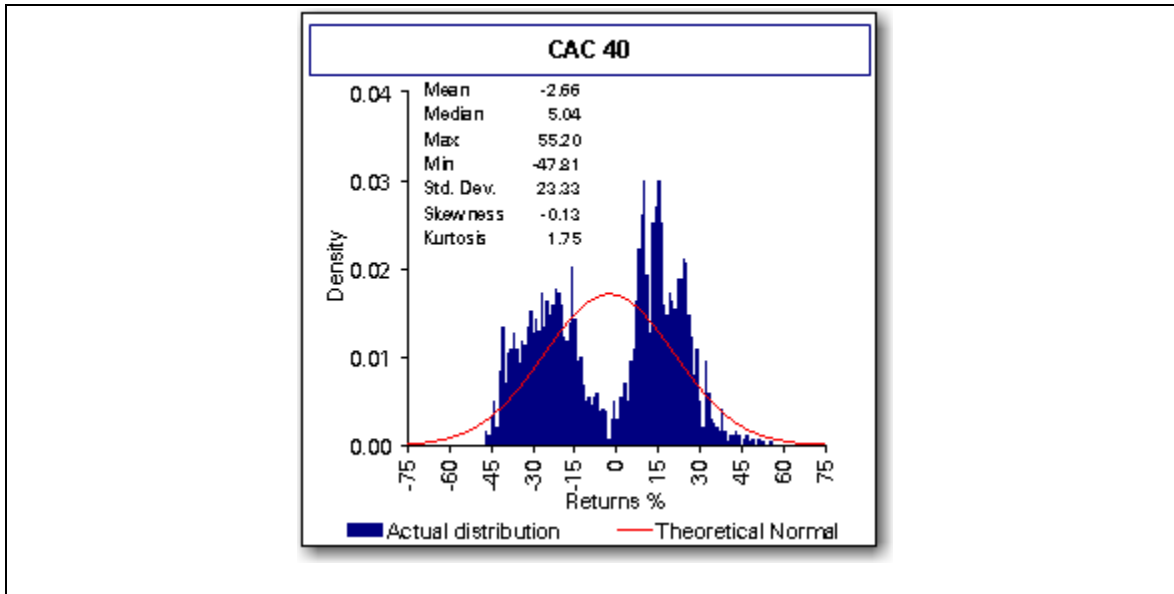
The messages are inconsistent, except for one thing: they suggest that there is no place for one's sensations. Specifically, emotions are irrelevant, respectively bad.

**Epistemology:** the investor's mind cannot achieve direct understanding of the market. Specifically, the investor cannot experience the price in a meaningful way, i.e. price sensations/qualia are considered epiphenomenal;

**Existentially:** the investor collective cannot desert nor can they contradict (read: beat) the market.

It becomes clear that, in Bateson's terms, the victim and the perpetrator are one and the same. Mr Market is a schizophrenic because we collectively create the separation of identities in one mind. Like the post-Copernican dilemma of being a peripheral and insignificant inhabitant of a vast cosmos, modern finance suggests that the average investor is a disposable agent in a global economic machine. Like the post-Cartesian dilemma of being a conscious personal subject confronting an impersonal universe, modern finance suggests that the average investor is a rational individual confronting the efficient market, a mindless but superior composite investor. These dilemmas are compounded by the post-Kantian dilemma of there being no possible means by which the investor can know the market in its complete essence, i.e. Roll's second critique (1977). Finally, like the post-Kahneman dilemma behavioural finance suggests that the usual (evolved) medium with which we build a relationship and understand another being, or even a collective group of beings, namely System 1 (e.g. emotions), should be switched off.

It seems Mr Market's "double-headedness", parallel to the advance of practices based on mechanistic interpretations of markets (e.g. financial engineering, high-frequency trading, monetary policies) has become particularly pronounced over the 10 years up to 2010, for example as reflected in the rolling annual returns (weekly prices) for the French CAC40 equity index:



Arguably separateness continues to linger and is, to some extent, appropriate for the natural sciences<sup>47</sup>, but it simply is not applicable to studying markets. Consequently it causes incomplete and inconsistent knowledge in finance.

Soros (1994), perhaps inspired by Popper's reflections on this problem in the aforementioned quote<sup>48</sup>, has always insisted on the inseparability of economic facts and thinking agents:

Thinking participants cannot act on the basis of knowledge. Knowledge presupposes facts which occur independently of the statements which refer to them; but being a participant implies that one's decisions influence the outcome. Therefore, the situation participants have to deal with does not consist of facts independently given but facts which will be shaped by the decision of the participants.

Soros' hypothesis, called reflexivity, basically states that the capital markets and the real economy mutually influence each other. It is a form of self-reference leading to downward causality. Specifically, prices affect fundamentals which, via adjustments

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47 Something along the lines of "The laws of nature to which objects are subjected do not depend on human behaviour".

48 Popper was Soros' mentor.

in agents' expectations, affect prices<sup>49</sup>. This feedback loop can, under certain conditions, cause capital markets to reach extreme disequilibrium, contrary to the equilibrium assumed in modern finance. Compared to particularly the EMH, Soros argues that capital markets cannot correctly discount (i.e. predict) the future because they are shaping it. Smithers agrees:

Asset prices have an important impact on the real economy, and one which has often been denied, partly because they have no place in the neo-classical model and partly because asset prices cannot become overvalued according to the EMH. But, once their importance is accepted, it explains why economic forecasts are not just fallible but must be so. (2011, p. 3)

#### Jungian note

In Jungian symbolism, reflexivity is represented by the Ourobouros, the serpent which is eating its own tail:



It symbolises self-generation by way of the ultimate form of "creative destruction". It also captures renewal by re-entry. Biologist Francisco Varela, for example, adopted it as a symbol for re-entry in his calculus of self-reference. In all its interpretations the image of the Ouroboros is a dynamic one.

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49 In an interview, James Montier echoes Soros' argument more bluntly: "The very process is sort of a demonstration of the Heisenberg Uncertainty Principle; you cannot observe without influencing. These guys have forgotten that their own actions matter. It's poker, not roulette, that we're playing here. The behavior of others, their actions, have an impact on the outcomes." (Welling@Weeden, Vol. 10, May 2008, p. 7)

In his own terms, Soros is echoing his mentor's quoted interpretation of downward causation of consciousness of which the collective invasiveness is the most crucial aspect. Although capital markets are exemplary of this in empirical terms, it applies more broadly:

Mental forces direct and govern the inner impulse traffic . . . the causal potency of an idea, or an ideal, becomes just as real as that of a molecule, a cell, or a nerve impulse. Ideas cause ideas and help evolve new ideas. They interact with each other and with other mental forces in the same brain, in neighboring brains, and, thanks to global communication, in far distant, foreign brains. And they also interact with the external surroundings to produce in toto a bustwise advance in evolution that is far beyond anything to hit the evolutionary scene yet, including the emergence of the living cell. (Sperry, 1965, p. 82)

There are many related variations of such causality. The more complex interaction between bottom-up and top-down causation is termed circular causality (e.g. Kelso, 1995) or the macro-micro feedback loop in complexity theory. This type of causality is also recognised in ethology, the root of evolutionary psychology, and is called niche construction.<sup>50</sup> Still, in turn, it is the dynamics of prices that could contribute to new thinking in the mind sciences on this topic.

Reflexivity itself has a rich history in the social sciences. Among its modern variants is performativity, a principle described within economic sociology. Performativity, according to Michel Callon, is the process whereby finance and its models are actualised: they not only describe the markets, but shape them at the same time. Callon uses the term "economics at large" to describe the collective efforts by agents and academics in understanding, analysing, and equipping the markets. He speaks in that light of the embedded nature of economies in economics:

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<sup>50</sup> Niche construction is the feedback process whereby a population modifies its environment to its own benefit, but then adapts to this modified environment, leading to follow-up modifications. The result is a reflexive co-evolution of the population and its environment.

there is not on the one hand a reality (concrete markets) and, on the other, discourses, analyses that account for this objective reality in a way that is true, or scientific, to a greater or lesser degree. The economy is a world that includes economics as one of its components in its own right. (2005, p.8)

More importantly from an archetypal point-of-view, Callon observes a certain innateness of reflexivity in economics:

The economy obviously existed before economics became a formal academic discipline, but this does not mean that we went from a state of non-reflexivity, monopolized by a small number of academic researchers. Any concrete economy is reflexive; the only change is in the social organization of reflexivity. (Ibid)

The assumption of separation between modern finance (as observer) and the market (as the observed) is basically untenable. Arguably this already starts to blur when finance academics participate in the markets, say by co-managing a hedge fund (e.g. LTCM) or simply by investing via their pensions<sup>51</sup>. It becomes problematic if their models start to shape the objects they are supposed to only describe "objectively"<sup>52</sup>. And it is tragically defeated if the founders themselves no longer believe in the realism, purpose and applicability of their models. In the words of Markowitz (2005, p. 29): "My own conclusion is that it is time to move on."

This puts a finger on the raw nerve of finance. Causality is central to modern science but has always been difficult to determine within the financial system. The traditional search is to find fundamental causes for the mental reactions, reflected in price moves, in capital markets. But the real economy, in terms of fundamental news, is not the source for its driving forces.<sup>53</sup> Anecdotally, in October 2000 the Federal Reserve Bank of Minneapolis held a conference on the great depressions across the

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<sup>51</sup> According to Gigerenzer (2007) Markowitz uses the 1/N rule to equally allocate his cash across assets in his personal portfolio.

<sup>52</sup> See MacKenzie (2005) who, from a performativity perspective, analyses the effect of the theory of options and of similar derivatives upon the market for such derivatives. He notes, for example, how the Black-Scholes model only started to show the implied volatility skew after the crash of 1987.

<sup>53</sup> See, for example, Cutler, Poterba, and Summers, 1989.

globe during the 20<sup>th</sup> century with the aim to find causes for economic depressions. That goal was not achieved, despite dozens of research papers. In an evaluative review of the conference, the editor of the Minneapolis Fed's Quarterly Review concludes "economists are, indeed, storytellers." Actually, Jung would say, economists re-enact and maintain myths just like all storytellers across time. Until the myth gets shattered, that is.

### **Investment Note**

In an interview with John Cassidy of *The New Yorker* (January 13, 2010), Eugene Fama, one of the founders of the EMH for which he recently received the Nobel Prize, showed how confusing (the order of) cause and effect can be for modern finance. To the first question on how he thought the EMH had fared during the crisis, he replied (emphasis mine):

"I think it did quite well in this episode. *Stock prices typically decline prior to and in a state of recession.* This was a particularly severe recession. *Prices started to decline in advance of when people recognized that it was a recession and then continued to decline.* There was nothing unusual about that. *That was exactly what you would expect if markets were efficient.*"

However, to one of the later questions, namely whether the start of the credit crisis predated the recession, Fama replied:

"I don't think so. How could it? People don't walk away from their homes unless they can't make the payments. That's an indication that we are in a recession."

Finally, to the next follow-up question of whether the recession predated August 2007, when the subprime bond market froze up, Fama answers:

"*Yeah. It had to, to be showing up among people who had mortgages.* Nobody who's doing mortgage research—we have lots of them here—disagrees with that."

For the record, the S&P500 did not peak until much later, namely October 11, 2007 at 1576.09.

Fortunately, from the above the first contours of an alternative ontological premise start to emerge. As I will show in chapter 6 it can be centred on the common denominator of the main academic factions and contains the complementarity

principle. Surprisingly, it allows finance to view causality and deal with current anomalies in a new way.

But first, following the earlier explanation of the relevance of Jung for this debate, in the next chapter I will introduce Jung's concept of archetypes.

## CHAPTER 3. ARCHETYPES

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*Endless repetition has engraved these experiences into our psychic constitution, not in the form of images filled with content, but at first only as forms without content, representing only the possibility of a certain type of perception and action. When a situation occurs which corresponds to a given archetype, that archetype becomes activated and a compulsiveness appears, which, like an instinctual drive gains its way against all reason and will.*

Carl Jung

*Hidden behind those images, never or rarely knowable by us, there are indeed numerous processes that guide the generation and deployment of those images in space and time. Those processes utilize rules and strategies embodied in dispositional representations. They are essential for our thinking but are not the content of our thoughts. . . . Dispositional representations exist in potential state, subject to activation, like the town of Brigadoon. Dispositional representations constitute our full repository of knowledge.*

Antonio Damasio

### 3.1 INTRODUCTION

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There are two concepts in complex psychology which are primarily of interest for this thesis, namely the collective unconscious and the archetypes. They are introduced in this chapter. Other Jungian concepts are derived from these and will be discussed in later chapters (e.g. participation mystique).

For reasons that will become clear I make a distinction between traditional archetypes and the numerical archetypes. In the following, I will always specify numerical archetypes as such whereas I will refer to the traditional archetypes simply as archetypes. My interpretation will be further explained, applied, and expanded upon in the remainder of this thesis.



My discussion, including selection of supportive quotes, is based on the extent that these concepts are of relevance for this thesis. In particular, it is biased towards chapter 5, where I will argue the primacy of numerical archetypes.

## 3.2 ARCHETYPES INTRO

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For those readers who expect a clear-cut definition of archetypes I quote James Hillman, developer of archetypal psychology, an off-shoot of complex psychology:

The curious difficulty of explaining just what archetypes are suggests something specific to them. That is, they tend to be metaphors rather than things . . . We can't seem to point to one or to touch one, and rather speak of what they are like. Archetypes throw us into an imaginative discourse. In fact, it is precisely as metaphors that Jung . . . writes of them, insisting on their undefinability . . . All ways of speaking of archetypes are translations from one metaphor to another. (1975, p.xiii)

This sentiment of undefinability is echoed elsewhere:

Ultimately, you cannot define an archetype, any more than you can define meaning. You can only experience it. In this sense, the theory of archetypes is rather like Newton's theory of gravity. You cannot see gravity. You can only infer it from observed phenomena, like apples falling from a tree. (Stevens, 2002, p. 76)

Still, there exists a large collection of definitions which has caused great confusion as to the meaning and purpose of the archetypal hypothesis. Inevitably, it led to misinterpretations, this to Jung's own frustration:

the concept of the archetype has given rise to the greatest misunderstandings and—if one may judge by the adverse criticisms—must be presumed to be very difficult to comprehend . . . My critics, with but few exceptions, usually do not take the trouble to read over what I have to say on the subject, but impute to me, among other things, the opinion that the archetype is an inherited representation. Prejudices seem to be more convenient than seeking the truth. (In Jacobi, 1959, p. x)

With this in mind, let's review what Jung himself did have to say about archetypes<sup>54</sup>. I therefore will use not only an above average number of quotes in the next section but also a highly selective sample. It will help to formulate my own interpretation of archetypes (see particularly Appendix) which is nevertheless as close to Jung's intentions as possible, whereby I have applied a filter to make it also consistent with recent insights from the mind sciences. More importantly this selection will eventually enable me to clarify my interpretation of numerical archetypes as subliminally operating mandates across interacting minds (e.g. crowds).

### 3.3 JUNG'S ARCHETYPES

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First, Jung compares the functioning of the archetypes with those of the bodily organs, and calls archetypes "organs of the prerational psyche" (CW11, para. 845). Next, Jung explains that, combined, archetypes form "a second psychic system of a collective, universal, and impersonal nature which is identical in all individuals" (CW9, para. 90).

More specifically, archetypes make up the deepest layer of the unconscious that we all share. Called the collective unconscious it should be distinguished from the personal unconscious which is, instead, made up by complexes. The archetypes find expression in symbolic manifestations of shared meaning, including myths, legends, motifs, and themes that are common to all humanity across time. As symbolising mandates, the archetypes influence human experience in similar fashion, regardless of the individual's background. As I'll explain later, they form common factors that

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<sup>54</sup> Admittedly, Jung's own views on archetypes, aka primordial images, changed over the years. Nevertheless, their key principles remained broadly the same.

'meaningfully' explain variations in human behaviour, including emotional expressions, across individuals and across time.

In the following description Jung clarifies that an archetype has no existence in consciousness but instead embeds a *possibility* of representation in consciousness. This is important in light of the "archetypal expectation" and "psychic probability" I will discuss later. He further emphasises that these possibilities should not be confused with their eventual realisations. Finally, he uses a metaphor to suggest that the symbolic representation, or archetypal image, emerges from smaller elements, as is true for complexity in general:

It is necessary to point out . . . that archetypes are not determined as regards their content, but only as regards their form and then only to a limited degree. A primordial image is determined as to its content only when it has become conscious and is therefore filled out with the material of conscious experience. Its form, however . . . might perhaps be compared to the axial system of a crystal, which, as it were, performs the crystalline structure in the mother liquid, although it has no material existence on its own. This first appears according to *the specific way in which the ions and molecules aggregate*. The archetype in itself is empty and purely formal, nothing but a . . . *possibility of representation which is given a priori*. The representations themselves are not inherited, only the forms. (CW9i; para. 155; emphasis mine)

Elsewhere, to underline this last point:

It would be a mistake to regard them as inherited ideas, as they are merely conditions for the forming of representations in general, just as the instincts are the dynamic conditions for various forms of behavior. (CW3, para. 550)

The unconscious shows acts of creation because it acts autonomously via the archetypes, thereby facilitating the mind's crucial ability to endogenously generate novelty. Specifically, archetypes operate outside the reach of conscious will while reaching for conscious content. They:

possess a certain autonomy and specific energy which enables them to attract, out of the conscious mind, those contents which are best suited to themselves. (CW5, para. 344)

Those contents become the cloak with which they 'reveal' themselves symbolically.

Jung called these symbolic patterns archetypal images. Although Jung suggested (CW9i, para. 152) that such images reflect both the typical behaviour and the typical situation in which that behaviour is expressed, I will make a distinction between archetypal image and archetypal situation.

Crucially from a complexity point-of-view (as I'll discuss later) Jung argues that the archetypal image is reflexive, or self-referential, in its symbolism:

[It] might suitably be described as the instinct's perception of itself or as the self-portrait of the instinct. (CW8, para. 277)

Among the purposes of this 'shaping of consciousness' is the symbolic message contained in the resulting archetypal image which embeds an element of prognostication:

it is only our consciousness that does not yet know; the unconscious seems already informed, and to have come to a conclusion that is expressed in the [archetypal image]. In fact, the unconscious seems to be able to examine and to draw conclusions from facts, much as consciousness does. It can even use certain facts, and anticipate their possible results, just because we are *not* conscious of them. (1964, p. 66)

The subliminal recognition (in the sense of 'realisation') of this image in a physiological and biological sense simultaneously gives rise to the emotional response, an instinctual pattern or fantasy structure (CW14, para. 602) that fits the image in a symbolic way. This is crucial for the archetypal workings, first, because it underlines the fact that archetypes can only be experienced. Jung emphasises that archetypes emerge as

at the same time, both images and emotions. One can speak of an archetype only when these two aspects are simultaneous. When there is merely the image, then there is simply a word picture of little consequence. But by being charged with emotion, the image gains numinosity (or psychic energy); it becomes dynamic, and *consequences of some kind must flow from it*. (1964, p.87; emphasis mine)

This last sentence underlines the second crucial point, namely the mental efficacy of archetypes through their images which Jung confirms elsewhere:

They not only occur in highly emotional conditions, but very often seem to be their cause. (CW3, para. 550)

As a conclusion, the collective unconscious as the "second psychic" domain is autonomous and objective, with archetypes as "determining influences" leading to shared collective experiences:

[It] is not subject to the caprices of our will. If, then, those qualities of elusiveness, superficiality, shadowiness, and indeed of futility attach to anything psychic, this is primarily true of the subjective psychic, i.e., the contents of consciousness, but not of the objective psychic, the unconscious, which is *an a priory conditioning factor* of consciousness and its contents. From the unconscious there emanate *determining influences* which *independently of tradition* guarantee in every single individual *a similarity and even a sameness of experience, and also of the way it is represented imaginatively*. (CW9i; para. 118, emphasis mine)

It is, again, interesting to compare this description with the words of Damasio:

The neural pattern attributed to a certain object is constructed according to the menu of correspondences by selecting and assembling the appropriate tokens. We are so biologically similar among ourselves, however, that we construct similar neural patterns of the same thing. It should not be surprising that similar images arise out of those similar neural patterns. (2004, p. 200)

### 3.4 THE ARCHETYPE ≠ THE ARCHETYPAL IMAGE

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By referring to "pre-existent forms" Jung made the distinction between:

1. The archetype-per-se, or archetype-as-such (in German "das Archetyp an sich"), also referred to as (confusingly) the "primordial image" or the "dominant". I call it the archetype-itself. In the following, when I use the term archetype I mean the archetype-itself, unless specified differently.
2. The archetypal image, or symbolic content, which emerges in consciousness.

Key in this distinction is that the archetype cannot be represented:

One must constantly bear in mind that what we mean by "archetype" is in itself irrepresentable, but that it has effects which enable us to visualize it, namely the archetypal images. (CW8, para. 417)

To put it more bluntly *in terms of the archetypal experience*: anything that remains unconscious is part of the archetype, everything else is part of the archetypal image, and elements (e.g. repressed memories) occasionally cross this border. There clearly is intense interaction, from feedback by consciousness to compensation by the unconscious. However, we have no 'idea' what happens to the feedback from consciousness to the unconscious, except that the latter continues its affective influence.

Although there remains a risk in using programming terminology to metaphorically describe the functioning of the mind, it may be helpful to some readers to clarify the aforementioned term "mandate" along these lines within a Jungian context. The distinction between the unconscious, archetypes and archetypal images is comparable to that between a black box, subroutines and functions. The black box is a program which internal workings are achieved via subroutines which remain hidden (our mandates). These subroutines operate rather independently 'behind the

scenes' in that they trigger or 'call' other (higher level) subroutines or functions but stay themselves within the black box. Specifically, subroutines do not return any value with the external environment. A function on the other hand is often called by a subroutine and returns a value. Like a function which enables a program to 'step' outside by revealing itself via a value, the archetypal image is the symbolic result of the cognitive function which the archetype called and with which the unconscious reveals itself symbolically.

Another way to explain the archetype as a mandate in terms of self-referencing instructions<sup>55</sup> is to use Mandelbrot's fractal, a well-known mathematical iteration, as a metaphor. The fractal is particularly suited in light of its relevance in finance. Mandelbrot's basic iteration (called the Mandelbrot set) is as follows:  $0 \rightarrow z \rightarrow z^2 + c$ . The mathematical iteration stands for the archetype: it is an instruction with fixed variables originating from the unconscious<sup>56</sup> (i.e. zero), for a pattern (in this case a fractal) to form from conscious inputs. The archetypal image is this fractal pattern. Moreover, the instruction also embeds the neuronal pathway that generates the emotional charge which makes the quality or meaning of the pattern come alive, e.g. the beauty of the fractal. Although the particular shape and pathway depend on the (selected) inputs, its essence remains invariable. Finally, any consciously derived fractal, whether it be formed on a computer screen, or on paper, or mentally visualised, is by definition triggered by conscious inputs and can only reflect the

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<sup>55</sup> In terms of complex psychology, my interpretation is motivated, among others, by Jung's insistence on their autonomous, determining influence, as well as the affective consequence of this influence. Other interpretations of an archetype, like a "template" from which the archetypal image emerges in consciousness, are too passive in my modest opinion. Also, any strict reference to algorithm is simply too deterministic and lacks the creative aspect of the mind. In terms of finance, the idea of a mandate fits the investment setting in which I will eventually place the archetypal hypothesis.

<sup>56</sup> Appropriate in this context. However, formally zero stands for the unus mundus, see section 5.2.

archetypal image, the symbolic meaning<sup>57</sup>. Or, in Plato's terms, the consciously derived fractal can only be an approximate expression of the "truth", i.e. the ideal fractal.

In terms of the debate between innateness and development (or emergence) of archetypes (see also chapter 5), I would put the argument in terms of distinct distributions in outcomes, keeping with the spirit of Jung's "probability":

1. A subroutine that is innate would show no distribution in outcomes, i.e. the outcomes are predetermined and fixed.
2. A subroutine that is biased would show a skewed distribution in outcomes, i.e. the outcomes show a certain tendency.
3. A subroutine that is random would show a normal or Gaussian distribution in outcomes, i.e. the outcomes are by chance.

I would argue that numerical archetypes, which find expression in numbers which are irreducible beyond their own "fixed" qualities, fall under category 1. It is in the interaction between numerical archetypes that any emergence originates and leads to the dynamics of pattern formation, including those involving the archetypes. The latter, on the other hand, fall under the second, biased kind. To continue with the fractal metaphor, their distribution falls under the power law category.

Finally, a distinction needs to be made between an innate *ability* and that of the *facility*. In other words, the innateness of an ability does not necessarily extend to the underlying structures which facilitate this. Taking number sense as an example<sup>58</sup>, the innate ability to recognise numerical patterns does not necessarily

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<sup>57</sup> To be clear, even the stated equation itself is part of the symbolic representation of the archetype, as it is a consciously derived/perceived equation. It is again an "as if".

<sup>58</sup> See also section 5.3



mean that the algorithms involved are innate. This relates, for example, to the ongoing debate concerning the differences between the various computational models of the mind (e.g. Hogenson, 2013).

### 3.5 THE DYNAMICS OF ARCHETYPES

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Jung always emphasised the dynamics of the archetypal workings, in particular their interrelatedness and co-influences, which make their individual identification via images difficult and separation impossible. Von Franz describes the archetypes as a field of connected psychic roots forming the collective unconscious and she highlights the particular resemblance with numbers when they are regarded qualitatively (1974; pp. 144-147). Moreover, in reference to the similarities with (or mirroring of) physical complex systems, she states:

In a fashion similar to certain arrangements in the material realm, groupings in the archetypal sphere that become defective spontaneously and actively take on new forms. The presence of existing structures facilitates the formation of similar complementary or identical representations. The fact that complex structures display a tendency to selectively influence one another, in the formation of similar structures, can also easily be demonstrated. (ibid; p. 146)

Following Von Franz' comment on overlapping and numbers, and ahead of more detailed discussions on the primacy of numerical archetypes, these archetypal dynamics can be expressed further in numerical terms. Specifically, correlation between two entities, as it approaches 1, reflects the strength of a shared identity: the two entities become one. Autocorrelation, on the other hand, reflects the strength of the self-identity. Applied to archetypal dynamics, correlation refers to the cross relationships between archetypal images, whereby close resemblance between

images indicates a high level of correlation, e.g. similar instincts. Autocorrelation on the other hand refers to the relationship between an archetypal image and its source, the archetype, whereby the numinosity (or affect) of the archetypal image across individuals reflects the level of autocorrelation. In other words, if an archetypal image only resonates with a few individuals (let alone one) it reflects a low level of autocorrelation. Specifically, the 'ideal' autocorrelation of 1 is never achieved and is in fact often much lower in cases of personal complexes, i.e. the archetypal image gets distorted in the personal unconscious by too much personal 'noise'.

In the final analysis, Jung states:

Contents of an archetypal character are manifestations of processes of the collective unconscious. Hence they do not refer to anything that is or has been conscious, but to something essentially unconscious. In the last analysis, therefore, it is impossible to say what they refer to. Every interpretation necessarily remains an 'as-if'. The ultimate core of meaning may be circumscribed, but not described. (CW9, part 1; para. 265)

Is there really that much difference between Jung's view on the primacy of numerical archetypes and their 'as-if' descriptions compared to modern interpretations of instincts guided by subliminal mathematical operations? Read, for example, the following description of the instinctual catching of a ball by Richard

Dawkins:

When a man throws a ball high in the air and catches it again, he behaves *as if* he had solved a set of differential equations in predicting the trajectory of the ball. He may neither know nor care what a differential equation is, but this does not affect his skill with the ball. At some *subconscious level*, something *functionally equivalent* to the mathematical calculation is going on. (1989, p. 96; emphasis mine)

### 3.6 THE ARCHETYPAL HYPOTHESIS IS UNIVERSAL

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Jung's archetypal hypothesis is universal in that it is a recurring theme which has been suggested in similar forms across time. There are thus various overlaps between Jung's archetypes and concepts of inherent patterns from other mind philosophies, varying from Greek to Chinese thought. Plato's ideals is an obvious example of the first category, the I Ching represents the second. In the words of Pauli:

With reference to Plato's philosophy, I would like to suggest that the process of understanding nature be interpreted as a correspondence of preexistent inner images in the human psyche with outer objects and their behavior. . . . The sought-for bridge between sense perception and ideas or concepts seems to be conditioned by regulating factors. (Aufsetze; in Von Franz, 1974, p. 36)

The concept of an archetypal mental structure is also reminiscent of Kant's postulation that humans have inherent mental categories and structures through which experiences of reality are filtered. Kant's central thesis is that what we can know is never the thing in itself (i.e. "Das Ding an sich"), but always the thing as represented. The looping nature of this representation was captured well by anthropologist Gregory Bateson, commenting on Korzybski's "The map is not the territory":

We say the map is different from the territory. But what is the territory? Operationally, somebody went out with a retina or a measuring stick and made representations which were then put on paper. What is on the paper map is a representation of what was in the retinal representation of the man who made the map; and as you push the question back, what you find is an infinite regress, an infinite series of maps. The territory never gets in at all . . . Always, the process of representation will filter it out so that the mental world is only maps of maps, ad infinitum. (1972, p. 454)

It is clear that the central theme of both Plato and Kant, namely the convergence of an inner and outer reality which occurs by means of inherent mental structures, is akin to Jung's archetypes. What is unique about Jung's theory is that the archetypal image, as symbolic representation of the archetype, is a fourth addition to Kant's three original "innate ideas" (i.e. space, time, and causality.) In other words, the archetypal hypothesis provides not only the archetype which is similar to the meta-concept of "innate idea" itself, but also suggest the archetypal image as an explanation of the internal representation, the conceptualisation of the archetype in consciousness. More importantly, Jung's realisation that the numerical archetype is the prime archetype can be justified in Kantian terms if we recognise that numbers form the only symbols with which Kant's 4 categories can be uniformly expressed: quantity, quality, relation and modality.

### 3.7 ARCHETYPES AS PSYCHOLOGICAL ADAPTATIONS

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Jung considered the biological manifestation of the archetype the most important scientific aspect. Specifically, he used instincts as examples of "inherited modes" of biological functioning, each expressing a universal "pattern of behaviour" and emphasised that:

This aspect of the archetype, the purely biological one, is the proper concern of scientific psychology. (CW18, para. 1228)

Human experiences over time have influenced our understanding of the archetypes. They manifest themselves in thematic images, like symbols, myths and concepts, which have captured eventful past experiences and, in a self-reflexive way, recall similar emotional responses by way of deeply felt recognitions of meaning. It is not

just metaphors we use to describe archetypes (see Hillman's quote earlier), but the archetypes themselves also project metaphors to communicate "This situation is like that, it is as-if . . . ". In Kantian terms, this process is a priori, that is to say at its (numerical) source it is innate and not based, nor depend on, personal experiences.

Jung used the following explanation:

When we examine these images more closely, we find that they give form to *countless* typical experiences of our ancestors. They are, so to speak, the psychic residua of *innumerable* experiences of the same type. They present a picture of the psychic life in the *average* . . . . In each of these images there is a little piece of human psychology and human fate, a remnant of the joys and sorrows that have been repeated *countless* times in our ancestral history, and on the *average* ever follow the same course. (CW15, para. 81; emphasis mine)

Others used similar terms, like the biologist Jacques Monod: "Everything comes from experience, yet not from actual experience, *reiterated* by each individual with each generation, but instead from experience *accumulated* by the entire ancestry of the species in the course of its evolution." (Monod, 1997, p. 112; emphasis mine). It is important at this point to make the distinction between physical survival and mental survival. Whereas natural selection resulted in the formation of the physical component of survival (i.e. the human genome), the formation of a mental component has always been questioned. Still, as McDowell speculates:

Not until the year 2000, when the sequence of the human genome was completed, was it known that a human has only about 32,000 genes. Estimates had been significantly higher. This small number focuses attention on complexity: how does the human complexity arise from so few genes? Part of the answer must lie in archetypes. (2001, p. 5)

Part of my answer is that archetypes help bridge the physical with the mental: survival *and* the meaning of survival. How then should we view the formation of this mental component in the context of evolution? Clearly evolutionary psychology provides some guidance. In particular, its concept of adaptive behaviour suggests

that there is an external expression to the internal evolutionary process of genetic survival and reproduction. Adaptive behaviour is behaviour that tended to promote the net lifetime reproduction of the individual or the individual's genetic relatives.

Specifically,

By promoting the replication of genes that built them, circuits that—systematically and over many generations—cause adaptive behavior become incorporated into a species neural design. In contrast, behavior that undermines the reproduction of the individual or his or her genetic relatives removes the circuits causing those behaviors from the species. Such behavior is maladaptive. (Tooby and Cosmides, 2005, p.21)

Apart from evolutionary psychology, people like Damasio, LeDoux, Panksepp, and others have shown that emotions play a coordinating role in our mental lives.

Whereas emotions make us feel life, thoughts make us reflect on it. In terms of life-threatening events, it has been the emotions of the survivors<sup>59</sup> that have served a purpose, as well as provided a meaning. First, in terms of physical survival, emotions serve a purpose in that they indirectly (i.e. via behaviour) contributed to the formation of the genes. These, in turn, led to the current neural wiring in our body, including the structure of our brain, which enables us to recognise patterns within our environment. Second, in terms of mental survival, emotions provide meaning in that they contributed to the formation of myths (cultural expression), knowledge (scientific expression), art (creative expression), and other forms of shared meaning. Tooby and Cosmides talk about "emotion programs" and point out that:

By coordinating the mental contents of individuals in the same situation (because both *intuitively know* that, e.g., the loss of your mother is, as a default, experienced as a sad and painful event), these programs also facilitate communication and culture learning,

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<sup>59</sup> Survivors include those who faced death and survived themselves, or those who (from a safe distance) observed the death of others and learned from those traumatic experiences. One could link this to (evolved) empathy and intersubjectivity while, again, it is difficult to separate nature and nurture.

both of which depend on a *shared frame of reference*. (ibid, p. 60, emphasis mine)

In other words, they found expression via mental imagery of these experiences, specifically via symbols with a common meaning. Jung argued that expressions surrounding death and similar highly charged emotional events revealed characteristics of an objective reality, and are of a uniform nature. That is to say, over time as well as across populations, and with certain gradations, multiple human beings experienced similar encounters with the outside world: archetypal situations. These 'thematic' experiences are symbolically expressed in archetypal images, which (re-)emerge in consciousness from the underlying neuronal firing patterns, once they are triggered by inputs from such archetypal encounters. For survival purposes it is the unconscious, as a complex adaptive selection ability, that selects which compensating inputs enter consciousness. This, in my view, is what Jung means by autonomous archetypes in terms of "attracting contents which are best suited to themselves."

#### **Side Note**

A number of neuroscientists have speculated that unconscious "mechanisms" can actually influence the creation of the neural wiring, thereby shaping the neuronal firing patterns which can lead to various neuropsychiatric symptoms. Brain scans can help to unravel these. Recently, for example, scientists at King's College London and the University of Melbourne have found, using brain scans, that psychological stress may be to blame for unexplained physical symptoms, including paralysis and seizures (Gale, 2014). This growing research focuses on the questions raised, for example, by Edelman:

"Is it possible that such active but functionally insulated thalamocortical circuits may underlie certain aspects of the psychological unconscious—aspects that, as Sigmund Freud pointed out, share many of the hallmarks of the "mental"—except that they do not make it into consciousness? Can such circuits *be created by mechanisms* of repression? May such active thalamocortical islands be capable of *triggering their own* basal ganglion *routines*, thereby accounting for slips of the tongue, action slips, and the like? Clearly much work needs to be done to clarify these issues . . ." (2007; p. 190; emphasis mine)

For all clarity, these “mechanisms of repression” are archetypal, according to complex psychology.

In short, those experiences which dealt with survival in situations of life or death not only became the most emotionally charged but, by definition, also survived in the survivors:

Once we see a couple of bears eat our relatives, the whole species gets a bad reputation. Then . . . when we spot a huge shaggy animal with large, sharpe incisors, we don't hang around gathering more data; we act on our automatic hunch that it is dangerous and move away from it. (Mlodinow, 2012, p. 146)

Via natural selection they survived as adaptations:

- Physically in the form of common genes and, by extension, a common neural circuitry;
- Mentally in the form of content, be it images or instincts (i.e. Edelman's “action slips”) formed by recurring neuronal firing patterns (i.e. Edelman's “routines”) with archetypes as their mandates (i.e. Edelman's “mechanisms”).

As aforementioned, Jung realised this biological aspect of archetypes, and how the interaction between external forces of the environment and the internal ‘life force’ of survival via adaptation impacted both the brain and the archetype. Accordingly, he saw the archetype as a psychic expression of the physiological and anatomical disposition (CW6, 1971, para.748).

The term “psychoid” was used by Jung and Pauli to capture the bridging purpose of archetypes between matter and mind, the external and the internal. Here Jung describes the psyche in terms of layers, implicitly suggesting some hierarchy in the archetypes and thus the need for numerical ordering:



The deeper layers of the psyche lose their individual uniqueness as they retreat farther into the darkness. "Lower down", that is to say as they approach the autonomous functional systems, they become increasingly collective until they are universalized and extinguished in the body's materiality, i.e. in chemical substances. The body's carbon is simply carbon. Hence, "at bottom" the psyche is simply "world". (CW9j; para. 271)

Pauli believed that this psychoid aspect of the archetype formed indeed a bridge between matter and mind and that it was a major contribution to our understanding of nature's laws:

It seems to me one has to postulate a cosmic order of nature—outside of our arbitrariness—to which the outer material objects are subjected as are the inner images . . . The organizing and regulating has to be posited beyond the differentiation of physical and psychical . . . I am all for it to call this 'organizing and regulating' 'archetypes.' It would then be inadmissible to define these as psychic contents. Rather, the above-mentioned inner pictures (dominants of the collective unconscious, see Jung) are the psychic manifestations of the archetypes, but which would have to produce and condition all nature laws belonging to the world of matter. The nature laws of matter would then be the physical manifestation of the archetypes. (1948, letter to Markus Fierz; in von Meyenn, 1993, pp. 496–497, via Atmanspacher, 2012)

The biological link, by extension, also means that just like organisms with the same genotype don't look or act the same way, because appearance and behaviour are modified by developmental conditions, archetypes do not manifest themselves in exactly the same shape. This is what Jung means with "The ultimate core of meaning may be circumscribed, but not described", as well as with "possibility of representation". Although they share the same underlying meaning, archetypal expressions (e.g. myths, art) differ in their appearances across cultures, individuals, and time. Therefore, apart from the biological conditioning, modern complex psychology also emphasises the social conditioning of archetypal images. In short, archetypal images embed nature and nurture, reflecting both the phylogenetic and the ontogenetic psyche. I have more to say about this in chapters 7 where I relate archetypes to mirror neurons and the intersubjective dynamics of crowds.

### 3.8 ARCHETYPES ARE INHERENT, NOT INHERITED

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In *The Origin of Species*, Charles Darwin (1859) used the term archetype as “the ancient progenitor” for “an existing general pattern” (p. 416). Although some have argued that Jung was not sufficiently familiar with Darwin’s theory and confused the interpretation of archetypes by inappropriately referring to the term “inherited”, he clearly dismissed the assumption that archetypes are inherited ideas or images:

Of course this term [archetype] is not meant to denote an inherited idea, but rather an inherited mode of functioning, corresponding to the inborn way in which the chick emerges from the egg, the bird builds its nest, a certain kind of wasp stings the motor ganglion of the caterpillar, and eels find their way to the Bermudas. In other words, it is a ‘pattern of behavior.’ This aspect of the archetype, the purely biological one, is the proper concern of scientific psychology. (CW 18; para. 1228)

And elsewhere:

It is not . . . a question of inherited ideas but of inherited possibilities of ideas. (CW 9i, par. 136)

As Stevens (2002) points out, instead of inherited the archetypes are *inherent*.

### 3.9 ARCHETYPES EMBED PROBABILITIES

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The tension between the mental forces that simultaneously cooperate and compete within the mind as a complex adaptive system (see chapter 1.4) builds the emotional charge. Eventually it is the trigger for, what I called earlier, the gut feeling

response to an archetypal situation. Such an instinctive response or “pattern of [instinctual] behaviour” is latent with a certain probability attached to its ultimate expression. Jung calls this the “psychic probability”, but I prefer to use the term “archetypal probability” as well as the related term “archetypal expectation”. Clearly, archetypal probability is different from statistical probability.

First, archetypal probability is the likelihood of an instinctive response which is conditioned by the distributions of the collective experiences of humanity over time. These distributions evolved in what evolutionary psychology calls the Environment of Evolutionary Adaptiveness (EEA). In other words, it does not simply involve events but rather the human experiences of those events (and their subsequent evolved adaptations.) Those ‘physical’ events only had meaning because they ultimately gave rise to an accompanying ‘phenomenal’ experience. A description (statistically or otherwise) of those events is incomplete for their understanding if it leaves out this phenomenal aspect.

Second, to formalise this a bit more by using statistical terminology<sup>60</sup>, the archetypal expectation is the unbiased archetypal estimator (e.g.  $b_2$ ) of the archetype ( $\beta_2$ ). In other words, if we would be able to draw many samples from the aforementioned populations of human experiences, framed in archetypal images, the average archetypal image would approximate the archetypal expectation. The quote from Damasio at the beginning of this chapter refers to disposition. Karl Popper used the same term in his interpretation of expectation which I believe is very relevant for my archetypal version because Popper confirms the unconscious pre-condition which, when “unfulfilled” by conscious reality, can lead to tension (i.e. “disappointment”):

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<sup>60</sup> Albeit ignoring technical issues, like normality of the distributions, etc.

We may characterise an expectation as a *disposition to react*, or as a preparation for a reaction, which is adapted to [or which anticipates] a state of the environment yet to come about. This characterization seems to be more adequate than one that describes an expectation in terms of states of consciousness; for *we become conscious* of many of our expectations only when they are disappointed, *owing to their being unfulfilled*. (1979, p. 344; emphasis mine)

Third, the probability of that particular response emerging (i.e. an archetypal image which perfectly matches the archetypal expectation) is due to, but also dependent on, the dynamics of the mind<sup>61</sup> as it engages with its environment, most crucially its interaction with other minds. This involves a subliminal and intersubjective evaluation process which I relate to another concept of Jung called "participation mystique" (see chapter 7). The crucial aspect of archetypal probability is the unquantifiable element of uncertainty implied by the fact that it involves the unconscious in its dealings with the unknown. It is the archetype's subliminal mandate which releases the response, i.e. triggers the neuronal firing pattern underlying the instinct, to a 'recognised' external pattern. How fitting (i.e. rational) this response is depends on whether the archetypal expectation is met. In cases of a complex, for example, whereby personal biases (e.g. repression) have distorted the archetypal image, the response can be neurotic. In general, the closer the archetypal image symbolises the unknown, the stronger the instinctive reaction (Popper's disappointment) because the unknown is furthest from "what can be expected". In other words, the response becomes more primordial (and irrational in the Jungian sense) when the external pattern cannot meet the expectations of the higher level archetypes (i.e. complexes). This makes prediction of situations which are shaped and influenced by the collective interaction of masses so difficult: what drives emotions most, and ultimately can lead to contagion and thus their

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<sup>61</sup> Again, basically self-organization within the context of a CAS.

convergence, is the universal recognition of an abstract archetypal pattern which emerges (i.e. as something distinguishable) from the unknown. Often that shared recognition is only reached at levels close to the most primordial instincts, involving the most basic 'objective' symbols, i.e. numbers.

As an aside, this makes the metaphor of the black swan so appropriate: it is a confrontation with, specifically by realisation of, the unknown which, again, is totally unexpected. Beyond the statistical characteristics of this phenomenon, the emotional reaction to something which is unknown, in this case to the point of 'this swan cannot be real', has been shaped by centuries of similar encounters by other humans<sup>62</sup>. In terms of expectations, whereas the statistical (rational) surprise is only in the colour (i.e. black vs. white), the archetypal (irrational) surprise is in the confrontation with the whole 'black beast'. The point is that, similar to valuation of assets in markets, the emotional reaction which prevails is the one valued as the most common denominator, i.e. a regression to the mean.

An archetypal expectation is met when the archetypal image reflects an unbiased symbolic meaning and in that sense is correctly recognised in terms of an appropriate emotional response. Ultimately, all archetypal workings aim at rebalancing emotions, i.e. to collapse the personal or crowd complexes which have distorted expectations. In practise this means that the lack, or (conscious/repressed) avoidance, of feeling alternative emotions does not mean they will not occur. On the contrary. The tension, or emotional charge, building up in this one-sided process increases the archetypal probability. To link this to Taleb's book titled "Fooled by Randomness", this is similar to the growing probability of actually drawing, without

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<sup>62</sup> No doubt, the fact that the swan had a black colour, whereas the expectation had been white, must have increased the assessment that something was wrong, e.g. "This is an evil swan".

replacement, a black ball from an urn of 999 red balls and one black ball while one is still drawing red balls: over time the full universe of events will occur, with the unlikely event becoming more likely, while more “shocking” in affect.

The archetypal image as a response pattern becomes part of consciousness, itself a complex property of the complex system we call mind. In a complex system, the whole is more than the sum of its parts exactly because those parts are often opposing, or bipolar, thus adding the dynamic tension to their individual existence which is the breeding ground for new discoveries. This tension is required for the system’s unique properties to emerge as autonomous acts of creation. In this case, as we will see, the multi-levelled dynamics between the archetypes in the unconscious reflexively affect our consciousness via multiple archetypal images which ‘describe’ the scenes of emotional expressions as the mind’s acts of creation.

A few more comments on Jung’s concept of a personal complex. It refers to the clustering of personal experiences around an archetypal expectation which distorts this unbiased archetypal image. The resulting divergence by the personal archetypal image reflects the size of the complex. For all clarity, the initial ‘veil’ is inherent and necessary: the archetype, being the originator of the mind’s novelty generating process, reveals its image in consciousness (where it is experienced in the phenomenal sense) but remains itself invisible.<sup>63</sup> So, although the archetype represents an unconscious objective reality, via its image it

behaves at the same time like a subjective one—in other words like a consciousness. Hence the reality underlying the unconscious

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<sup>63</sup> As I will regularly argue, in order for the mind to remain effective, e.g. not become predictable, stay creative, etc., both the unconscious origin and the phenomenal culmination of insights (which are its internal surprises that allow it to adapt to external ones) will have to escape any axiomatic/mechanical capture. In other words, it is no wonder (and better for humanity) that these fringes of the mind remain the most elusive.

effects includes the observing subject and is therefore constituted in a way we cannot conceive. (CW 8, para. 230)

Furthermore, Jung viewed complexes as “living units of the psyche” (CW9i, para. 210). Sandner and Beebe state that each complex carries

a splinter consciousness of its own, a degree of intentionality, and the capability of pursuing a goal. They are like real personalities in that they contain images, feelings, and qualities, and if they engulf the ego, they determine behavior as well. (1995, p. 302)

Stated in portfolio management terms, like discretion can tilt a portfolio away from the default mandate (e.g. the strategic allocation), personal experiences can tilt the subjective archetypal image away from the objective one, sometimes to the point that a rebalance is required. For those more comfortable with modern neuroscience, the creation of the personal complexes can be explained by using Edelman’s theory of reentry. Among his preconditions for primary consciousness to emerge is the mechanism to re-categorise on the basis of innate non-conscious categories. The early phase of his reentry loop consist of personal experiences being mapped onto these default categories, thereby reshaping them. This reshaping, in my interpretation, is similar to the formation of complexes.

#### **Investment Note**

In the remainder of this thesis, I will explain the similarities between the archetypal hypothesis and some of the dominant models in finance. Taking my cue from Jung’s statement on archetypes as unconscious “factors influencing the conscious situation” I will briefly introduce the Arbitrage Pricing Theory, or APT, which I use as a metaphor to explain archetypes by comparing them to the market’s risk factors (with more details in chapter 9 on Archetypal Valuation). In similar fashion to investment portfolios, which are exposed to those common risk factors, or styles, archetypes act as the common regressors of our emotions. Another way of saying this is that archetypes are the collective and common denominators which divide us in a uniform way. At the same time we need to reconcile with the archetypes in order to become psychologically whole as individuals, as well as unite with the collective human mind. Jung called this “individuation”, a process comparable to Maslov’s self-actualisation. It is a central part of my thesis for the following reason: individuation is the process of the individual investor to reconcile his consciousness with that of the market while, at the same time, understanding its symbolic

language as a way of communicating by way of price discovery. This, by the way, does not equate to conformity but rather leads to a heightened awareness of emotional imbalances in the market and the mental strength to counterbalance, i.e. to stick to the trend or become the contrarian.

Consequently, among the practical differences between Archetypal Valuation and traditional investment methods is the treatment of emotions. Whereas the latter ignore, or even try to exclude, emotions from the investment process, Archetypal Valuation provides a purposeful focus on the emotions of investing. As investors we experience the collective unconscious through symbols in the form of prices and their patterns, i.e. price dynamics. We encounter these, and discover their meaning, via trading and the feelings it invokes, not by repressing those feelings. In short, Archetypal Valuation means experiencing the market with AVIR (chapter 10) offering a complementary method to balance the current overreliance on analytics.

The previous sections introduced complex psychology's main concepts of the collective unconscious and the archetypes. In order to lead up to the hypothesis (chapter 6) and other key elements of this thesis, the next chapter will first discuss the main aspects of consciousness from a finance perspective.



## CHAPTER 4. CONSCIOUSNESS, A CONVERGENCE PLAY

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*There is not a single important idea or view that does not possess historical antecedents. Ultimately they are all founded on primordial archetypal forms whose concreteness dates from a time when consciousness did not think, but only perceived.*

*Carl Jung*

*CW9i, para. 69*

### 4.1 THE RELEVANCE OF CONSCIOUSNESS FOR FINANCE

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There are many definitions of consciousness despite (or perhaps because of) the fact that it is an elusive phenomenon. The philosopher John Searle, for example, provides a useful interpretation:

“Consciousness” refers to those states of sentience and awareness that typically begin when we awake from a dreamless sleep and continue until we go to sleep again, or fall into a coma or die or otherwise become “unconscious”. (1997, p. 5)

To complement Searle’s words I like to add the following which views consciousness from a research angle, upon which I will expand later. If nothing else, it provides an initial reference to start this chapter.

### **Interpretation of consciousness**

Consciousness is how information feels like when it is physically simulcasted in the body. Simulcasting means, roughly, that the information is shared across the nervous system, particularly the brain, both when it arrives from the outside (e.g. external "news", i.e. events) and when it is generated from the inside (e.g. internal "news", i.e. insights).

A conscious experience is therefore the simultaneous physical and phenomenal realisation of that information without necessarily being complete, meaningful, or otherwise fully knowledgeable.

We can study 'consciousness' indirectly from a third person perspective, or directly experience it from a first (and second person) perspective. The former relates to how the mind physically functions and operates, i.e. how the consumption of information actually occurs (e.g. firing brain patterns). The latter relates to how the mind phenomenally perceives the information, as it is consumed: subjectively in the case of personal consciousness, respectively intersubjectively in the case of collective consciousness.

To view the markets in general, and investing in particular, from a consciousness perspective is very relevant. Any focus on investor decision-making, for example, implicitly refers to investor consciousness because it creates awareness and allows thinking and decision-making in the first place. More importantly, this perspective highlights the neglected phenomenal dimension of having skin in the game of investing<sup>64</sup>, namely how it feels like to be (part of) the market's mind.

Earlier I explained the concept of paradigm in terms of a framework of thinking for science, and how paradigms can shift. I also described the premise of modern science and mentioned the specific shift in the mind sciences (i.e. Sperry's revolution), where the role of consciousness in shaping science is acknowledged. So

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<sup>64</sup> In the sense of having your own money, e.g. capital or income, directly committed whereby price moves have an immediate impact on your wealth.

the shift from objective science to epistemic science, of particular relevance in the social sciences, implies the central role of consciousness in the scientific description of phenomena. Still, the cognitive sciences (under which behavioural finance falls) are lagging, according to philosopher Jaegwon Kim:

the last two decades has seen a phenomenal growth and proliferation of research programs and publications on consciousness . . . Although consciousness research is thriving, much of cognitive science seems still in the grip of what may be called methodological epiphenomenalism . . . It is an ironic fact that the felt qualities of conscious experience, perhaps the only things that ultimately matter to us, are often relegated . . . to the status of "secondary qualities," in the shadowy zone between the real and the unreal, or even jettisoned outright as artefacts of confused minds. (2005, pp. 10-12)

The following broadly lists the various points of view taken in the scientific debate on consciousness, each with its explanatory limitation:

- Dualism is the view that there are two metaphysically different kinds of phenomena in the universe, the mental and the physical. A distinction is often made between (Cartesian) substance dualism and property dualism. The former considers the mind to be made up of a different substance than matter, whereas the latter considers the mind to be made up of a set of different properties. Property dualism argues that these mental properties are irreducible to physical properties. Still, the general problem with dualism is that it does not explain how the physical and the mental relate and interact, which they clearly do. Crucially, the tendency to distinguish the physical from the mental originates in the latter, which contributes to making it a hard problem.
- Monism is the view that there is only one substance. It knows three main variations:

- Materialism (aka physicalism) suggests that only the physical is real. Its strong form, called reductionism, argues that we must reduce mental states to physical (brain) states. It does not explain the interiority of the mind, i.e. the subjective experience of consciousness. According to many reductive physicalists this experience is considered an illusion. Non-reductive physicalism on the other hand, acknowledges the special nature of mental properties which cannot be reduced to the physical domain.
- Idealism is the opposite of materialism. It argues that spirit and mind are real and that matter is an illusion. It does not explain the experience of matter, e.g. the physical pain and appearance of a bruise after hitting one's head against the hard-wood doorpost.
- Neutral monism argues that reality is all of one kind but that it is neither physical nor material, thus 'neutral'. As aforementioned Jung and Pauli's dual-aspect version falls under this category.
- Panpsychism accepts that both matter and mind are real. More specifically, it is the view that consciousness is present everywhere in the universe, and that it is a natural state in humans, animals, and objects from rocks to thermostats. It does not explain how consciousness can emerge in those objects which have no nervous system, i.e. it denies the unique role of the brain, without which we wouldn't even be discussing consciousness. In other words, it does not consider evolution to have played a role in creating consciousness.

Despite different views, the focus on consciousness is a common theme among various scientific fields in mind research, in particular psychology, quantum physics, neurobiology, cognitive studies, philosophy, and artificial intelligence. I view consciousness research therefore as the 'convergence play' in the sciences, and will argue in this chapter that it is one of the main drivers for the current as well as future debates on paradigms in economics<sup>65</sup>. Specifically, I believe this final frontier of human mentality is the final frontier of behavioural finance and will have a significant impact on the way we invest money in the future. In turn, the peculiar phenomenon of intersubjectivity in markets, e.g. the market mood, offers a rich area of potential insights to mind researchers, with large amounts of data available.

Finally, the particular relevance of Jung's archetypal hypothesis in this context lies in the fact that it attempts to bridge mind with matter, particularly by way of the psychoid nature of the archetypes, i.e. it offers a psychophysical model.

## 4.2 THE PROBLEM OF CONSCIOUSNESS

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In 1994, a young philosopher named David Chalmers gave a presentation at the conference "Toward a Science of Consciousness"<sup>66</sup> in Tucson, organised by the University of Arizona. It was his debut on this scene and in his presentation Chalmers made a clear distinction between, what he called, the "easy problems" of consciousness and the "hard problem". His presentation, subsequently published in a

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<sup>65</sup> As an aside, I believe that underlying this debate is a deep psychological yearning for the qualitative (emotional) side of exchanges and trade, in order to restore an unhealthy imbalance, caused by the dominant obsession for quantification (rationality). The growing influence of behavioural finance but also that of responsible (sustainable) investments, also known as SRI or ESG, is a reflection of this. The latter integrates non-financial, e.g. ethical, criteria in investment decisions.

<sup>66</sup> For a recollection of his "appearance" as well as his impact, see Hamerhoff (in Blackmore, 2005).

special edition of the *Journal of Consciousness Studies*, has become seminal and the Tucson 1994 conference has since been widely regarded as a landmark event.<sup>67</sup>

Although he broadly repeated what others had stated previously, Chalmers excelled in clarifying the details concerning the main issue. According to Chalmers, the easy problem of consciousness refers to issues like the deliberate control of behaviour, the reportability of mental states, and the integration of information by a cognitive system. These issues can be functionally explained, i.e. they form the easy problems of consciousness. The really hard problem of consciousness, aka the mind-body problem, is the problem of experience in terms of conveying a phenomenal state. In Chalmers words:

When we think and perceive, there is a whirl of information-processing, but there is also a subjective aspect. As Nagel (1974) has put it, there is something it is like to be a conscious organism. This subjective aspect is experience.

He argues, echoing philosophers over the ages, that the traditional scientific method of observation has been unable to explain this phenomenon<sup>68</sup>. Chalmers' definition of the hard problem of consciousness received a lot of support, but also hard criticism, in particular from philosopher Daniel Dennett (1991). Dennett and his supporters adhere to consciousness eliminativism: they basically deny the existence of consciousness by arguing that it is a mental illusion. Consequently, they believe there is no hard problem of consciousness. An intense debate between "Dennett's A-team and Chalmers' B-team" (Blackmore, 2005) has been raging ever since, reinvigorating the historic disputes surrounding the mind-body problem.

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<sup>67</sup> In April 2014 I attended the 20<sup>th</sup> anniversary conference in Tuscon. Speakers, apart from Chalmers, included Deepak Chopra, Daniel Dennett, Christof Koch, Roger Penrose and John Searle.

<sup>68</sup> In Chalmers' view any theory of consciousness should take experience as fundamental.

I will contribute to this debate by offering my interpretation of the issues it has raised in the context of my hypothesis, in particular the “hard problem” of finance. As I will argue in more detail in chapter 6, following on from chapter 2, finance has generally ignored what it feels like being (in) the market and, consequently, failed to explain why it matters. My emphasis on the qualitative aspects of investing, in particular the qualia of prices, not only reflects a counterbalance against an overemphasis on the quantitative aspects of investing which subscribes to a separation between the investor (in particular his emotions) and the market. This qualitative overlay (e.g. market moods) is at the core of considering capital markets as a collective consciousness. John Searle states:

The problem of what accounts for the inner qualitative states of awareness or sentience called ‘qualia’ is not an aspect of the problem of consciousness that we can set on one side; it *is* the problem of consciousness, because every conscious state is a qualitative state. (1997, p. 50)

This eventually leads to my description of the hard problem of finance which I will reveal in chapter 6. What is required is a theory of market consciousness to deal with this and related problems. In that light, Chalmers for example, provides a useful framework for what he calls the psychophysical principles that should go into any theory of consciousness. However, Chalmers focuses only on individual consciousness<sup>69</sup>. Instead, as aforementioned, various researchers<sup>70</sup> while

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<sup>69</sup> In private correspondence on my proposition of the market’s mind-body problem, Chalmers responds: “I’m inclined to think that this problem is analogous to one of the easy problems of consciousness rather than the hard problem, as it is a problem about the performance of objective functions. But of course you might well think that experience plays a causal role in the explanation of these functions, in which case a full solution to the easy problems may require a solution to the hard problem along the way.” Actually, my general argument goes further: the reason that the hard problem is so difficult is because any explanation of what accounts for qualia should apply to the qualities of intersubjective experiences too. Consequently, the problem of the hard problem is that such qualities cannot be isolated as they are intrinsically, even intimately linked to ‘other minds’. Concretely: in markets my mood is influenced by the market’s mood to the point that I not only need to consider it in my trading but that I am often overwhelmed by it. This is thus not simply “a problem about the performance of objective functions”.

<sup>70</sup> Including Jung, Nietzsche and Durkheim.

representing different view-points, argued for the collective aspect of consciousness.

More recently, Edelman and Tononi argue:

we emphatically do not identify consciousness in its full range as arising solely in the brain, since we believe that higher brain functions require interactions both with the world and *with other persons*. (2000, p. xii; emphasis mine)

Hut and Shepard explain further that:

intersubjectivity cannot be seen as a simple superposition of subjective and objective properties. Rather, acknowledging consciousness in others as being on par with our own, we see a world around us, filled with physical objects as well as conscious experience of humans . . . The fact that we can and do interact with others is an aspect of conscious experience that is at least as important to us as the possibility that we humans have of reflecting upon our own existence. (1995, p. 15)

It argues explicitly for a second-person epistemology regarding consciousness and states. This means that for me to have an intersubjective experience requires your conscious engagement (rather than, say, just your physical presence). The dynamics of our interaction renders the experience, e.g. I enjoy sex/this meal/this game/etc. with you. In other words, I am aware that my experience is coloured by your experience (and know that this is vice versa), even though I do not intimately know "your colours".

Below I will therefore expand upon Chalmers' principles by detailing the intersubjective aspects of investor consciousness; in other words how personal investor consciousness is irreducibly embedded and entangled in the collective consciousness of the market.

Whereas intersubjectivity is excluded, for example, in two of the main theories of mental states, the theory-theory and the simulation theory, it is central in my account of the market mind. As aforementioned, the relevance of consciousness for markets works in reverse as well: markets are relevant for the broader theory of



consciousness. I thus believe (and hope) that my reflections will provide a useful contribution to advance the debate between Dennett's A-team and Chalmers' B-team.

But before I describe this framework as applied to the financial system, I would like to explain in the next section some of my own reflections on consciousness in general, and the primacy of the numerical archetypes in particular (even though a detailed discussion of the numerical archetype will be postponed until chapter 5). In general, the connection to Jung's insistence on the fact that archetypes can only be experienced<sup>71</sup> is not coincidental. The irreducibility of consciousness, i.e. the completeness of experience, involves unconscious processes. In the words of Pauli (1948, p.5; see also Pauli and Jung, 1955), they give rise to "the archaic point of view, which also strives to express the emotions and feeling-toned values of the soul with its symbolic images." In other words, it is the archaic perspective of consciousness by way of archetypal images which adds facts over and above the scientific point of view. Pauli concludes:

There is an initial proposal to recognize the significance of the scientific stage of knowledge for the development of scientific ideas by supplementing the investigation of this scientific knowledge [Erkenntnis nach aussen] with an investigation directed inward [Erkenntnis nach innen]. The former process is devoted to adapting our knowledge to external objects; the latter should bring to light the archetypal images used in the creation of our scientific concepts. Only by combining both these directions of research may complete understanding be obtained. (Ibid)

### 4.3 CONSCIOUSNESS AND NUMERICAL ARCHETYPES

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<sup>71</sup> This is an even more pronounced aspect in archetypal psychology (e.g. Hillman), which views archetypes as phenomenal.

In this section I need to briefly discuss the implicit requirement of enumeration for any consciousness to emerge. In the next chapter I will explain in more detail why this makes the numerical archetypes the prime archetypes: they enable (ego) consciousness to emerge from the unconscious. More specifically, they facilitate, for example, Fichte's pre-reflective self-awareness. Fichte (1795) argued that consciousness must be "familiar" with itself at a primordial rudimentary level before it can self-reflect. My basic interpretation of the binary origin of numerical archetypes is to paraphrase Jung (see full quote below): "Before me there was zero (nothing), I am one, the other makes us two". Only then can consciousness reflect on "What is one?", "What is one compared to two?", and other thoughts.

For now, this form of distinction subsequently determines the level of consciousness. With identification comes discrimination, a more advanced form of distinction. Edelman (1992) has called this "self-nonsel self discrimination", a notion later extended by Damasio (1999). A system can reach a level of higher consciousness, for example, if it is able to identify itself, i.e. self-refer. Rolls, reflecting on the nature of human consciousness<sup>72</sup>, considers it to be:

the state which arises in a system that can think about (or reflect on) its own (or other people's) thoughts, that is in a system capable of . . . higher order thoughts . . . On this account, a mental state is non-introspectively (i.e. non-reflectively) conscious if one has a roughly simultaneous thought that one is in that mental state. Following from this, introspective consciousness (or reflexive consciousness, or self-consciousness) is the attentive, deliberately focused consciousness of one's mental states. (2008, p. 144)

Regardless of the level of consciousness, the numerical archetypes seem to form the primary unconscious source(code) for symbols to emerge in the initial stage of

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<sup>72</sup> And referring to Chalmers and others with similar views.

consciousness, preceding verbal language, for example. We find evidence of this in symbolic expressions by our earliest ancestors as well as young children, and even animals like the great apes. Those expressions include art, fibres, and tools. They signal the emergence of consciousness facilitated by the presence of rudimentary numerical thinking:

To pick up a rock, examine it, and then make it correspond to the class of Acheulian fist hatchets is to engage in abstract thinking in sets . . . To create a fibre matrix of strands and knots for baskets and skirts, such as we see on the reverse side of the statuette called the Goddess of Lespugue, is to begin to think in numbers and recurring patterns. (Thompson, 2007, p. 102)

Carruthers and Worthington conclude that “The flame of mathematical intuition is within children” (2006, p. 236), and first drawings by young children have a striking similarity to the early cave paintings by Palaeolithic humans. Their drawings reflect spatial patterns of elements like circles, dots, grids, spirals and zigzags:

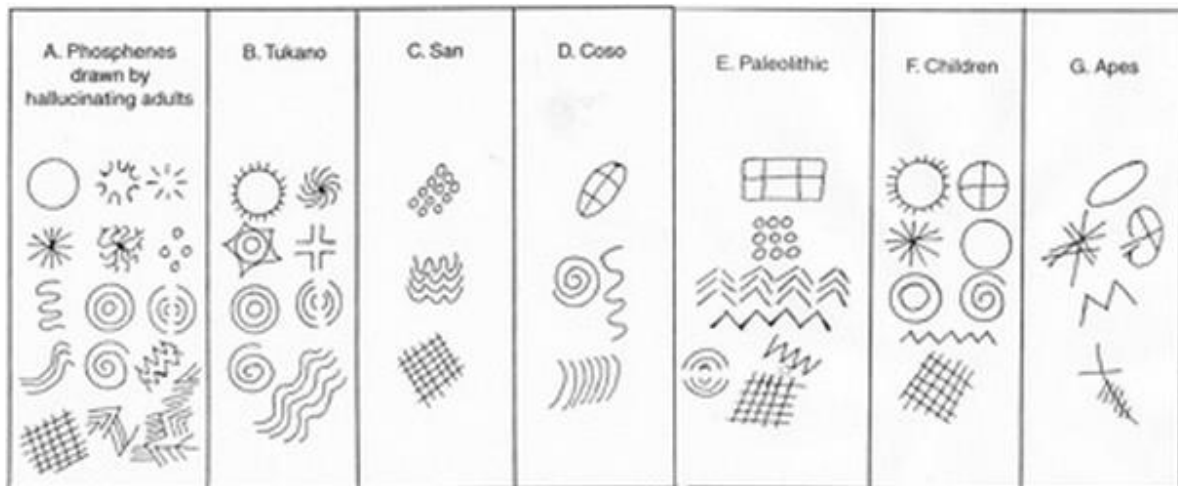


<http://antiquity.ac.uk/projgall/diez/diez.html>



<http://www.euopreart.net/slide.htm>

Nancy Aiken (in *The Biological Origin of Art*, 1998) broadened the similarity further by showing such patterns also occur across cultures. She argues that humans have always had the capacity to understand such imagery:



The link to similar patterns in markets, e.g. waves, cycles, is easily recognised. Of particular relevance for chapter 10 is that Aiken<sup>73</sup> argued that “Art is a bridge between unconscious and conscious thought”, echoing (but probably unaware of) Jung’s practise of active imagination.

In any case, the pre-requirement consist of the unconscious non-conceptual ability to enumerate, scale, and transform before symbols, art, and by extension consciousness, can emerge:

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<sup>73</sup> At a symposium, *Art-Body-Mind: An Integration*, Ohio University, Athens, Ohio, Nov. 2-5, 2000.

<b>The mind can:</b>	<b>... because the numerical archetypes enable:</b>
Differentiate	Enumeration = to individuate situations, objects, etc. via numbers.
Assess	Scaling = to locate and constrain these in space and time along a number line (e.g. in the extreme leading to polarity).
Integrate	Transforming = to combine/parse (e.g. add, deduct) numbers into a new number whose level is benchmarked against an internal threshold, for example to mark a trigger.

How can this emergence of consciousness, in humans or any other cognitive system, be interpreted in terms of knowledge? In the initial stage when, in Jung's words, the mind "did not think but only perceived" the system was only aware of binary symbols. Before consciousness there was nothing (the number 0). Identification meant consciousness (1, e.g. "I") emerged from nothing (0, e.g. "the unconscious") and subsequently distinguished it from the "other" (generating 2, e.g. "the outside world").<sup>74</sup> Jung provided the following description:

one is not a number at all; the first number is two. Two is the first number because, with it, separation<sup>75</sup> and multiplication begin, which alone make counting possible. With the appearance of the

<sup>74</sup> I also like to think of the one and the two from the perspective of the inhale-exhale dynamic, particularly in view of the Binarius (see chapter 8).

<sup>75</sup> Jung's separation is not meant in the physical sense, but rather in terms of discrimination.

number two, *another* appears alongside the one, a happening which is so striking that in many languages "the other" and "the second" are expressed by the same word . . . The "other" can have a "sinister" significance—or one feels it at least, as *something opposite* and alien . . . Two implies a one which is different and distinct from the "numberless" One. In other words, as soon as the number two appears, a unit is produced out of the original unity, and this unit is none other than the same unity split into two and turned into a "number". The "One" and the "Other" form an opposition, but there is no opposition between one and two, for these are simple numbers which are distinguished only by their arithmetical value and nothing else. The "One", however, seeks to hold to its one-and-alone existence, while the "Other" ever strives to be another opposed to the One. The One will not let go of the Other because, if it did, it would lose its character; and the Other pushes itself away from the One in order to exist at all. Thus there arises a tension of opposites between the One and the Other. (Von Franz, 1974, p. 97)

The tension of opposites, the "interplay of Yin and Yang" (Jung, 1955, p. 49), is at the core of the dynamics generated by competition and cooperation in complex adaptive systems, including markets (see also Schotanus, submitted). The relevance of this in the context of consciousness in the capital markets arises from the fact that, in principle, "One" and the "Other" stand for the individual investor, respectively his counterparty in the (intended/executed) trade, and vice versa. However, the distinctions blur as identification of any individual "other" is usually impossible in today's markets: the other becomes the composite investor (i.e. the market)<sup>76</sup>. As a consequence investors' respective consciousness becomes submerged into that of the market which is the "inter" of intersubjectivity. This signifies the second person perspective of the relationships involved, and we need to make clear that it is different from the third person perspective. Specifically, the third person perspective is that of the 'absent observer', unaware of the intrinsic qualities experienced by (those that make up) the market mind.

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<sup>76</sup> They could also stand for any of the other opposing parties one recognises in markets like buyer/seller, bulls/bears, long/shorts, etc. (who ultimately produce the opposing forces of demand/supply). However, the crucial aspect is that any individual investor is aware of being (part of) "One" in relationship with the "Other".

Throughout this thesis, for example in section 4.6 below, I will expand on this, specifically by describing how prices capture co-cognition (at the conscious level), as well as participation mystique, (the “automatic unconscious induction” to use Gallese’s terms [2005]) among investors. These are two complementary aspects of the overall market mentality that complete its ‘state’ and the embedded informational content of prices cannot be mined purely by analysis.

In summary, there are three steps in the emergence of consciousness for which the numerical archetypes provide the subliminal evaluation template:

- Differentiation (or distinction), which requires enumeration;
- Assessment, which requires scaling;
- Integration, which requires transformation.

If the archetypal hypothesis, by way of the numerical archetypes, offers a psychophysical model to bridge the material (i.e. real) with the mental (i.e. imagined), it is important to formalise this in a more robust framework that I will present in chapter 6.

Next, it is helpful to discuss two of the popular concepts in consciousness research, namely supervenience (philosophy) and complementarity (physics) in the context of investor phenomenology.

#### 4.4 SUPERVENIENCE AND COMPLEMENTARITY

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Supervenience is a conditional-relationship concept with a rich history. It offers an analytical framework to tackle complex topics, like consciousness.

Based on various interpretations<sup>77</sup> a set of properties A supervenes upon another set of properties B if, and only if, any two objects which share all properties of B also share all properties of A. Another way to say this is that A-properties supervene on B-properties if, and only if, all x and y that are B-indiscernible are A-indiscernible. In mathematical terms:

$$\forall x \forall y (\forall X_{\in B} (Xx \leftrightarrow Xy) \rightarrow \forall Y_{\in A} (Yx \leftrightarrow Yy))$$

There are various implications and extensions if this relationship holds:

- The B properties are called the base and the A properties the supervenient properties.
- Two objects which are B indistinguishable are also A indistinguishable.
- Two objects which are A different are also B different.
- The A properties do not explain anything above and beyond what the B properties already explain.
- There are further distinctions between global and local supervenience, as well as implications for epiphenomenalism, reductionism, etc. For example, psychological properties can be supervenient on physical properties without being reducible to them.

Among the researchers which applied this concept to the mind sciences are Davidson (1970), Kim (1993, 2011), and Chalmers (1996). The question which is central in

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<sup>77</sup> E.g. Stanford Encyclopedia of Philosophy, Chalmers (1996), Kim (2011).



this regard is whether consciousness is supervenient on the physical body. Again, this should not be confused with reduction: if mental properties supervene on physical properties it does not automatically follow that they can be reduced to physical properties. Others (e.g. Searle [1995], Dretske [1998]) use the analogy with money to explain supervenience (as well as intrinsic/extrinsic properties and other philosophical issues) in order to show how it relates to behaviour.

We can apply supervenience to EMH, for example. EMH considers price to be the B property of assets and value to be the A property. Consequently, the difference in the value between gold and silver, for example, is equal to the difference in their price. Also, according to the EMH the values of gold and silver do not explain anything above and beyond what their prices already explain. Another example is the no-arbitrage argument: Asset A supervenes on the underlying Asset B, because the pay-off for Asset B (reflected in its price) can be replicated without extra costs via Asset A (reflected in the price of A which equals the price of B).

But the relevance of supervenience to finance goes further. Most experts in the mind sciences hold that economic properties supervene on physical properties<sup>78</sup>. Instead, I argue that this is doubtful because it certainly does not extend to capital markets with which the economy is intrinsically linked. Specifically, price qualia are the qualitative characteristics of market states that are shared between participants in that market. This differentiates them from the traditional highly subjective qualia from isolated instances of experience in the individual's interiority. Moreover, those proponents who accept non-supervenience of consciousness in general also have to accept the non-supervenience of the market's mind.

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<sup>78</sup> If two worlds are exactly the same physically, they are the same economically.

First, similar to the distinctions within an archetypal situation (in particular between the archetype and its image), we need to clarify the initial conditions in a situation of supervenience. Let's do a thought experiment of a laboratory test to determine what green feels like.<sup>79</sup> The reason I place it here is, as I will show, the link to experiencing (changing) coloured prices on screens and monitors by millions of investors.

As part of this test a monitor has a screen which is grey in its initial state. Next, a green flash appears on the screen which is observed by a subject who, in turn, is studied by a researcher. We are particularly interested in the following elements of this test:

1. Physical object: screen (i.e. area of pixels)
  - a. property: colour
  - b. characteristic: green
2. Human 1: subject
  - a. property: senses
  - b. characteristic: greenness
3. Human 2: researcher
  - a. property: senses
  - b. characteristic: greenish

Let's discuss this in more detail, while limiting it to the main aspects:

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<sup>79</sup> The experience of colours is among the most frequently used topics in the mind sciences, particularly in the context of qualia.

- The subject is instructed to focus on the screen's colour. In other words, the green colour is the only characteristic we are interested in, even though it forms part of a host of other characteristics, derived from various properties, e.g. the screen's shape.
- The characteristic green is static and not influenced by the other elements of the test, e.g. the subject cannot turn green into red. (For comparison with the more common "tomato" example: the subject cannot change the colour of the red tomato she's observing).
- The characteristic greenness is the subject's perception of the screen's green in the form of an experience.
- The characteristic greenish is the researcher's perception of the subject's greenness in the form of an observation of the subject's brain<sup>80</sup>.

In the test, the subject's perception physically consists of neuronal patterns triggered by the senses which underlie the experience. The experience of green (called greenness) is the reality (of green) as known to the subject, not the reality (of green) as such. The subject can say: "I know what green feels like".

In turn, the researcher studies the physical processes, i.e. neuronal patterns, of the subject while the latter is experiencing green. The researcher produces a description of his observation which details the physical state of experiencing green. This description (called greenish) is the reality (of green) as known by the researcher,

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<sup>80</sup> The researcher does not observe the green flash himself. Also, we could make this more complicated by expanding this to another "experience" of the observation, but this would take the discussion into unnecessary complications which detract from the main points.

not the reality of green as such, nor the reality as known by the subject<sup>81</sup>. The researcher can say: "I know what green does to the subject's brain."

Although the subject is obviously exposed to the physical processes, because they are embodied, greenish does not encompass greenness. On the other hand, the subject's greenness does not provide information about the physical processes underlying the experience, like the researcher's greenish does<sup>82</sup>. In short, we end up with a knowledge 'gap'.

In order to resolve this, let's expand from 'binary knowledge' to show how knowledge can be shared or conveyed as information. First, we need to make a distinction between physical and phenomenal facts. Physical facts are derived from/provided by physical objects in our environment, as well as our bodies. They can be studied from a third person (external) perspective and verification is according to the physical sciences, like physics, chemistry and biology. The resulting knowledge is descriptive, like "greenish", and can be shared as information. Phenomenal facts are derived from/provided by experiences. At the individual level, they can only be studied from a first person (internal) perspective, with verification via reflection. The resulting knowledge is experiential, like "greenness", and cannot be shared *as information*. The difference in (type of) knowledge forms part of the debate of the supervenience of consciousness. Specifically it follows what philosophers call "The Knowledge Argument" which (according to the Stanford Encyclopaedia of Philosophy) "aims to establish that conscious experience involves non-physical properties. It rests on the idea that someone who has complete physical knowledge about another conscious being might yet lack knowledge about

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<sup>81</sup> Although the researcher can himself be familiar with experiencing green, e.g. empathy, this is not the issue here.

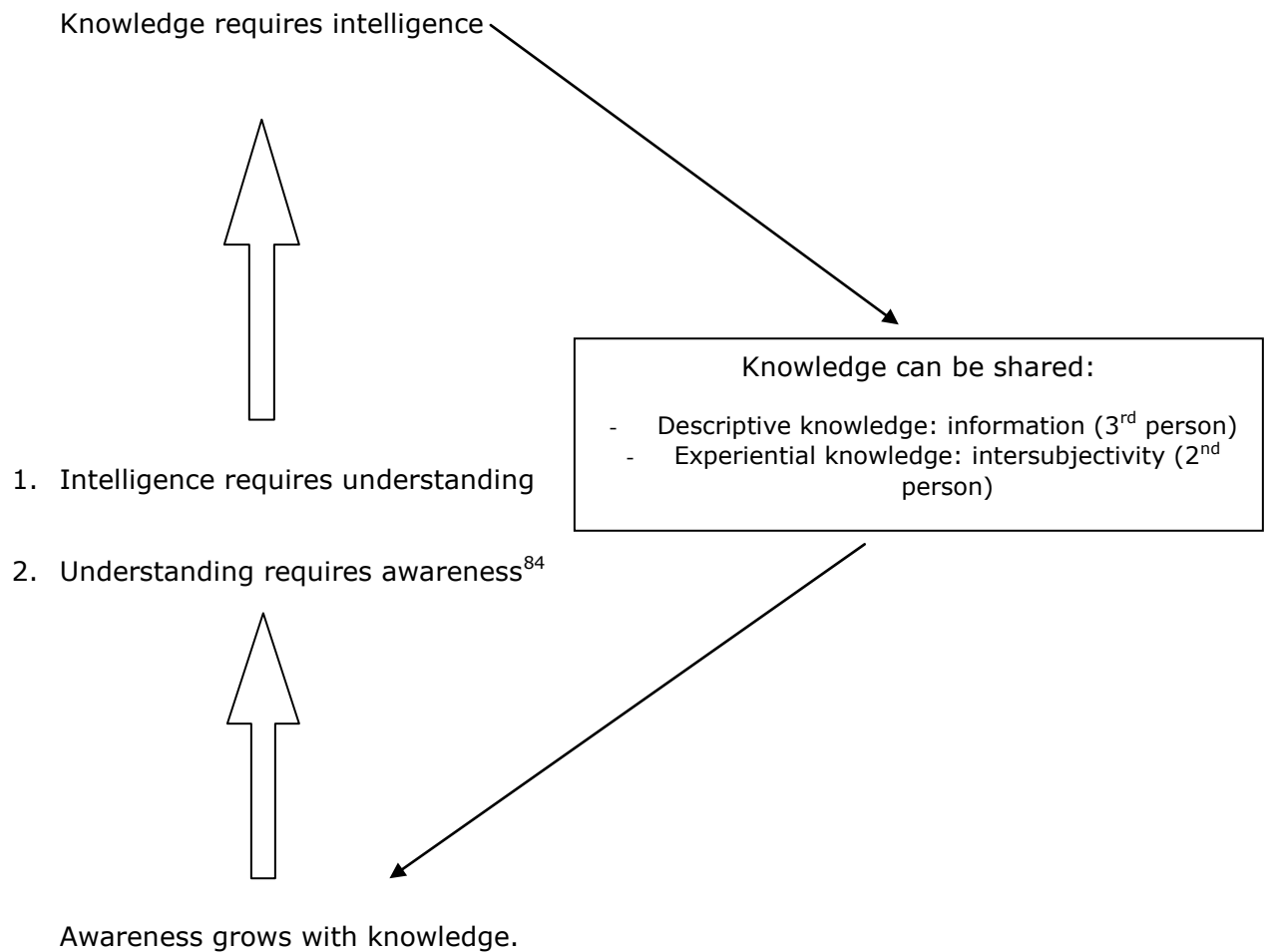
<sup>82</sup> Except "after the fact" by way of interpreting the description of the researcher.

how it feels to have the experiences of that being.” Nevertheless, there are situations where the characteristic itself not only contains knowledge in the form of information. It also reflects the composite of multiple experiences, i.e. experiences at the collective level. In other words, it reflects intersubjectivity which is the only manifestation of experiences where they are shared. In short, these are the various distinctions: physical/phenomenal, descriptive/experiential knowledge<sup>83</sup>, and internal/external observer.

Next, in order to place this in the context of consciousness, let me introduce Penrose’s (1995) hierarchy of elements in consciousness, whereby I’ve added two levels, because I believe they are implied. These levels refer to the content part of consciousness, namely memories in general, and knowledge in this particular case:

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<sup>83</sup> Experiential knowledge includes tacit knowledge.



### Investor Note

It makes sense for investors to make a distinction between information and knowledge. Let's ignore for the moment private information which can be profitably used by investors (albeit illegally if it is inside information). Clearly most investor insights occur through thorough analysis of new public information, or revisions of existing public data. I call these analytical insights. Once an analytical insight is

<sup>84</sup> Penrose distinguishes this "passive" aspect of consciousness from the active aspect, free will. There are various comments about free will elsewhere in this thesis.

shared (with your colleagues in the investment team, for example), it becomes testable public knowledge. If the investor keeps the insight to herself, it remains private knowledge. Similarly, there are two ways for an intuitive investment insight, which emerges from the unconscious, to progress into price discovery. In both instances the intuitive insight is transformed into an analytical insight. First, the insight is turned into an investment strategy but kept private by the investor, in order for it not to lose its profitability<sup>85</sup>. The second way is for the investor to create a logical 'rational' confabulation in order to communicate it as a 'sensible' story to others.

As aforementioned at the very least the early state of awareness of one's being includes distinction, the recognition of "the other", i.e. the outside world.

Consciousness thus implies an awareness of one's "I on x" relationship with one's surroundings, with survival as its core motivation. The interactions with one's surroundings ultimately lead to cognition, the build-up of knowledge<sup>86</sup>, which can be and mostly has to be shared<sup>87</sup> among humans (a phenomenon also observed among higher primates.) Knowledge largely makes up the 'content' part of consciousness and is exemplary for the reflexive and epistemological nature of consciousness, at least for humans: as we learn, and gain knowledge, we reflect on the nature of our consciousness, from which we learn more, gain further knowledge, and . . . the loop continues.

As a consequence, from a content perspective it is fair to say that we are not only more conscious than the apes, but also more conscious than our forefathers (although clearly this does not imply that we are the wiser.) This is reflected in our body of knowledge. Our awareness of our being, in relation to its surroundings, increased due to our search for knowledge. Many others have explored this and the collective dimension of knowledge, for example, has been called extelligence by

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85 Still, advocates of EMH will argue that eventually other investors (i.e. the market) will have figured out this insight and the profitability will be arbitrated away.

86 Cognition is derived from the Latin cognoscere, "to know".

87 For example, to meet the standards of science or simply to survive.

mathematician Steward and biologist Cohen (1997), and memes by biologist Richard Dawkins (1976).

The key conclusion is that both descriptive knowledge and experiential knowledge capture a mental state, but that each captures a different but complementary aspect of this state: the physical/quantitative aspect, respectively the phenomenal/qualitative. Basically, this is the argument used by proponents against supervenience of consciousness: consciousness is irreducible to the underlying physical processes, and the phenomenal aspect adds something to our understanding above and beyond the physical.

The knowledge 'gap' lies on the right side of Penrose's figure above: our current scientific methods cannot confer the "feels like" quality of a subjective experience. But what about shared experiences? In my view, this area has been overlooked which has as much to do with ignored methods as it has to do with ignoring the "feeling content" of shared experiences. Say we agree that:

1. We have an inclination for empathy, whether or not induced unconsciously, e.g. via mirror neurons;
2. We can employ contemplative methods which appeal to our non-analytical capabilities of understanding;

Then it follows that the availability of verifiable empirical data which reflect shared experiences in an "objective" format, i.e. numbers, may help us to further our understanding of consciousness and thus enhance the debate. Enter price data.

But before I discuss this in the chapter 6 (and 8), let's return to the earlier thought experiment. A more advanced variation would be to switch the colour of the screen dynamically between red, orange, and green to see the difference in feelings across



the experienced, i.e. introduce qualia dynamics. What remains is that there is only a one-way relation between the characteristic of the colour and that of the senses, namely from the former to the latter. The set-up in which we are interested would be something like this:

1. Physical object: screen (reference: traffic light)
  - a. property: colour
  - b. characteristic: green, yellow, red
2. Human 1: subject
  - a. property: senses
  - b. characteristic: greenness, yellowness, redness
3. Human 2: researcher
  - a. property: senses
  - b. characteristic: greenish, yellowish, reddish

The reader is invited to think about this set-up, but basically the same discussion on the single colour green applies to this multi-colour set-up. The final stage of this thought experiment is to imagine the investor's reality of observing (e.g. Bloomberg) screens whereby the impact of changing colours on those screens immediately relate to her existing 'real' wealth, again in capital and/or income terms. Specifically, in experimental terms, the 'subject' knows that the colours reflect an increase, no change, respectively decrease in her 'state of' wealth. Extending the set-up by having the screen reflect changing numbers and colours, thereby completing the reality for investors, justifies using the term 'price qualia'. Moreover, the fact that

the coloured numbers on the screens are influenced, in real-time, by the collective consciousness (e.g. mood) of those that observe them justifies using the term intersubjectivity to describe shared market states.

### **Jungian note**

What is the relevance of supervenience to archetypes? Earlier I described the emergence of an archetypal image in consciousness from an archetypal situation, simpliciter the encounter with "the other", i.e. the external world<sup>88</sup>. The constellation of the latter, in terms of a physical pattern, combines with the invoked neuronal pattern within the human body to form a physical state. Although they interact, they are two separate but complementary physical aspects of the archetype. But the archetype does not supervene on the purely physical state, because it is experienced. That is to say an archetype reveals itself in consciousness by way of its affective image: symbolic meaning is attached to (physical) information. Jung calls this attachment "emotional charge", whereas Damasio calls it the "somatic mark". In Jung's terms, the archetypes "attract, out of the conscious mind, those contents which are best suited to themselves." To an external observer of this situation, however, the cerebral state of the subject is indirectly observed as a perceptual image. The knowledge, in terms of being in this situation, is experiential to the subject but remains descriptive to the external observer (assuming he can focus exclusively on the perceptual image). Both images not only differ in their knowledge content, but also only 'seemingly' represent a physical reality, i.e. only 'as if'. Again, the archetype remains elusive.

Additionally, we can also view knowledge from the following angle. First, there is the distinction between 'known' knowledge which is available in consciousness and the 'unknown' knowledge, some of which occasionally emerges from the unconscious, either as (repressed) memories or discovered new insights. Second, and related, we need to distinguish between scientific wisdom, or rational knowledge, and perennial wisdom, or absolute knowledge. Rational knowledge is gained by way of analysis. Analysis is an active form of investigation in the sense that it is a 'quest for knowledge' with a mental effort to gain knowledge. The process of analysis is linear, one piece of the puzzle at the time. By definition, scientific wisdom is also shared, in order for it to be verifiable by others. The latter can use the same method, analysis, to that end. Perennial wisdom on the other hand is almost the opposite. It is based on subjective experiences in the form of intuitions which have often been described as occurring in a higher state of consciousness (e.g. Harman and Rheingold, 1984). Moreover, intuition is received via meditation or (unconscious) reflection. These are the passive forms of investigation in the sense that they are more like a 'request for knowledge', a mental wish to be bestowed a gift of knowledge. The arrival of such a gift is then as a complete package, i.e. each piece of the puzzle falls into place in a parallel fashion. The passive nature of this 'opening up' or 'letting go' does not make it easier to achieve. In fact, the reward from this request lies in the realisation of the ability itself to intuit, to see the whole picture at once. In the words of David Bohm,

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<sup>88</sup> Which is the distinction with which consciousness, i.e. enumeration, starts.

this “ability to perceive or think differently is more important than the knowledge gained.” Finally, sharing intuitions has always been problematic. This is due, mostly, to the difficulty of explaining the novel and often transcendent meaning of such insights.

Next, I will discuss further the collective aspect of consciousness.

## 4.5 THE COLLECTIVE ASPECT OF CONSCIOUSNESS

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*Nothing, I repeat, more excellent for preserving their being can be wished for by men, than that all should so in all points agree, that the minds and bodies of all should form, as it were, one single mind and one single body.*

*Spinoza*

John Searle makes a key observation in the modern debate on consciousness:

The natural sciences typically deal with those features of nature that are intrinsic or observer-independent in the sense that their existence does not depend on what anybody thinks. Examples of such features are mass, photosynthesis, electric charge, and mitosis. The social sciences often deal with features that are observer-dependent or observer-relative in the sense that their existence depends on how humans treat them, use them, or otherwise think of them. Examples of such features are money, property and marriage. A bit of paper, for example, is only money relative to the fact that people think that it is money. The fact that this object consists of cellulose fibers is observer-independent; the fact that it is a twenty-dollar bill is observer-relative. . . . My present state of consciousness is intrinsic in this sense: I am conscious regardless of what anybody else thinks. (1997, p. 15)

Although this emphasises the reality of consciousness as an experience, there is an important aspect of such a state that needs further consideration: its isolation, i.e. whether the experience is shared at some level or otherwise is influenced by others. Specifically, following up on Searle’s argument: I may be conscious but what I’m conscious of can certainly be influenced by what others think. Crucially, I am receiving continuous confirmation of my conscious state by (interacting with) other

humans. In fact, there are indications that group processes greatly contributed to the evolved human ability to be self-aware (e.g. individuality).<sup>89</sup> Moreover, the 'problem of other minds' can only be truly 'solved' by way of humans interacting, e.g. exchanging, which goes beyond inferences from simply observing their behaviour. Vice versa, I would risk losing my sense of consciousness without such interaction.<sup>90</sup> In short, what has largely been missing in the debate on the nature of consciousness is its collective dimension. Elsewhere Searle acknowledges this as much:

I am convinced that the category of "other people" plays a special role in the structure of our conscious experiences, a role unlike that of objects and states of affairs . . . But I do not yet know how to demonstrate these claims, nor how to analyze [it]. (1992, p. 127)

Capital markets offer a rich source for research in that respect. The reason why I use the thought experiment is that no market exists without at least one human buyer and one human seller.<sup>91</sup> Ahead of the "voting" quote by Keeton and Gould which I use in chapter 5 to argue the primacy of numerical archetypes for consciousness, Benjamin Graham, Mark Rubinstein<sup>92</sup> and others have referred to the market as a voting device that continuously interrogates millions of voters about their attitudes and then summarises the results of the poll in the form of market prices. Since other investors typically have information that any individual investor will not have, this

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<sup>89</sup> See, for example, Donald (1991).

<sup>90</sup> To clarify this further, very much in the spirit of Jung's "one" and the "other", let's do another thought experiment. Imagine you've stranded on a remote uninhabited island (think Thom Hanks in *Cast Away*). After some time, without any contact with any conscious being, how would you know whether you're conscious? In line with Searle's earlier comment, how can you make the distinction between being awake or sleeping, for example? It is only in your dreams that you may be conscious of other people (i.e. who appear in them), but they cannot confirm that you are conscious, if only because they are not themselves consciously there. Moreover, you're generally not aware it is a dream. Overall, I am inclined to think that there has to be the possibility, i.e. by 'objective' others, to falsify the hypothesis of "I am conscious", and that this thus requires the presence of conscious others. However, I admit that I have not thought this through sufficiently yet to discuss this in more detail here.

<sup>91</sup> For those who point to electronic markets: that includes humans who code the algorithms that do the buying and selling.

<sup>92</sup> One of my professors at UC Berkeley and a supporter of the EMH.

aggregation may incorporate better-informed subjective beliefs into the prices than any individual investor could determine on their own.

In particular, I argue that capital markets demonstrate intersubjectivity empirically at a massive scale. Intersubjectivity has a conscious and an unconscious aspect. At the conscious level, the strength of intersubjectivity depends on the extent of joint attention. Joint attention refers to the instance when two or more individuals are aware that they are paying attention to the same object or event. In the case of modern capital markets this consists of, at least, a buyer and a seller who gaze at a price on the screen ahead of any trade. At the unconscious level, the strength of intersubjectivity depends on the extent of participation mystique, or intentional attunement to use Gallese's term: "an automatic unconscious 'induction' in each participant of what the other is feeling." I will discuss participation mystique in more detail in chapter 7.

Intersubjectivity is present in capital markets as long as prices are live, i.e. markets are open and/or securities are traded.<sup>93</sup> Although they may not be aware of each other as individuals, nor of the shared affect of prices and their patterns, investors are aware that, ultimately, they are paying attention to the same prices. In other words, by simultaneously observing prices, which reflect their collective behaviour, they are (aware they are) observing each other. The implication of this, in terms of an intersubjective reflexive loop of mind reading, was captured, for example, by Keynes in his famous analogy of the beauty contest:

It is not a case of choosing those [faces] that, to the best of one's judgment, are really the prettiest, nor even those that average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what

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<sup>93</sup> Increasingly this means continuously, i.e. 24x7.

average opinion expects the average opinion to be. And there are some, I believe, who practice the fourth, fifth and higher degrees. (1936, p. 156)

Earlier we saw that symbol transformation plays a crucial role in planning whereby the individual reflects on (1) past experiences, and (2) other minds (and their reflections). This symbolism also allows information to be shared and communicated. In fact it is the shared experiences which receive the most recognised symbols, namely those with a common understanding. In any case, at the personal (internal) level, as well as the shared collective level, symbolism always involves multiple minds, and includes experiences gained by previous generations which ultimately have shaped the common physical neural circuitry. In Edelman and Tononi's words,

conscious thought is a set of relations with a meaning that goes beyond just energy and matter . . . The action of your brain, and all its mechanisms, bottom to top, atoms to behavior, results in a mind that can be concerned with processes of meaning. While generating such immaterial relationships that are recognised by it and other minds, this mind is completely based in and dependent on the physical processes that occur in its own workings, in those of other minds, and in the events involved in communication. . . . But obviously there is a realm created by the physical order of the brain, the body, and the social world in which meaning is consciously made. That meaning is essential both to our description of the world and to our scientific understanding of it. (2000, p. 219)

In chapter 6 I will round up my case by arguing more formally how markets comply with a specific set of criteria required for collective subjectivity and explain why they are so unique in that respect.

But first, in chapter 5, I will discuss the complexity in (complex) psychology through the primacy of numerical archetypes.

# CHAPTER 5. COMPLEXITY IN PSYCHOLOGY: THE PRIMACY OF NUMERICAL ARCHETYPES<sup>94</sup>

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## 5.1 INTRODUCTION

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More than 50 years ago, Jung expressed some impatience when he stated that “my later and more important work (as it seems to me) is still untouched in its primordial obscurity” (1951-1961 (1976, p. 309)). Since then Atmanspacher (2006), Giegerich (2007), Robertson (1995), von Franz (1974) and others have highlighted this distinction and expanded on Jung’s later work.

One of the goals of this thesis is to contribute to the task of raising Jung’s later work from its primordial obscurity by focusing particularly on the numerical archetypes. In this chapter I attempt to achieve this by way of a three-pronged approach:

1. By placing complex psychology in the framework of complexity theory.
2. By linking numerical archetypes to modern neuroscientific insights in number sense, also known as the number module.<sup>95</sup>

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<sup>94</sup> Elements of this chapter appeared earlier in Schotanus (2013).

3. By explaining the empirical relevance of numerical archetypes in price discovery, the self-organizing principle in the capital markets that allocate resources in modern society.

To support my thesis I include insights, first, from other mind sciences (apart from complex psychology). With regard to philosophy, various comments by Jung (e.g. "object of experience" in von Franz, 1974, p. 121; "phenomenal world", CW14, para. 667) highlight the relevance of (contemporary) philosophy to complex psychology, in particular regarding the mental efficacy of archetypes (e.g. "consequences of some kind", 1964, p. 87; "seem to be their cause", CW 3, para. 550). I use the insights from the ongoing debates on consciousness and the mind-body problem to clarify the issues involved in exploring the nature of archetypes. Among the philosophical concepts I use is the aforementioned quale (multiple: qualia) which refers to the intimately qualitative characteristic of an experience including its duration. It means, for example, that my distinction between cognitive and psychoanalytical versions of the unconscious is less strict than some readers perhaps would like it to be.<sup>96</sup>

Second, I include insights from finance which offers an appropriate way of thinking about Jung's "psychic economy" (CW 7, para. 332) and its capital. It also leads to a particular view on the collective unconscious. Jung, in a letter to Pauli (Cazenave, 1984, p. 253), described the collective unconscious as a "space in which an infinity of observers observe the same object." Acknowledging the collective unconscious experience of a crowd under the spell of participation mystique I argue that the objects of the crowd's attention have, by definition, a deeper shared (or objective)

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<sup>95</sup> Although I will only discuss number sense, as Charles Card kindly pointed out to me there are a number of related areas of mathematical cognition that are also relevant, including set-based quantification, parallel individuation/object tracking systems and mental rotation.

<sup>96</sup> For support for such an integrative view see Epstein, 1994; Edelman and Tononi, 2000; Gallese et al., 2007; Mlodinow, 2012.



meaning if they involve less subjective symbols, i.e. numbers. The link between the crowd-size and the 'common denomination' (i.e. power) of a symbol was expressed, for example, by Robertson (1995, p. 149): "If the problem . . . engages most of humanity over a large period of time, then the emotional energy is correspondingly greater, as is the pressure, and as is the eventual symbol that emerges." This obviously applies to the capital markets where large crowds discover emotionally highly charged prices. In chapter 7 I relate participation mystique involving numbers to recent neurological insights, in particular the discovery of mirror neurons and the accompanying unconscious induction (e.g. Gallese et al., 2007). Moreover, to answer Cambray, capital markets arguably are a sea of synchronicity and exhibit "emergent processes . . . in focused group activities" (2009, p. 92) which organise the collective market mind.

The remaining sections of this paper will deal with the following topics. First, I will introduce the link between complex psychology, complexity theory and numerical archetypes. Subsequently, I will summarise number sense and equate it to numerical archetypes. This is followed by explaining the experience of numbers by way of price discovery in the capital markets, before I offer my conclusions.

## 5.2 COMPLEX PSYCHOLOGY: FROM THERAPY TO THEORY

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Jung's later work can be characterised as a general, more abstract interpretation of the psyche pushing along the way concepts like the unconscious and the archetypes toward a theory rather than a therapy. Jung preferred to use the term complex psychology to identify his theory of psychology, "signalling a shift in emphasis from practical analysis to general psychology" (Shamdasani, 2003, p. 14). Jung wrote

"Complex psychology means the psychology of '*complexities*', i.e. of *complex psychical systems* in contradistinction from relatively elementary factors." (Ibid; emphasis mine). Specifically note that Jung refers to complexities, rather than complexes. Also, earlier attempts link Jung's thinking to chaos theory<sup>97</sup>, a sub-branch of complexity theory. They include Van Eenwyk (1991), Saunders and Skar (2001), MacLennan (2007), Hogenson (2007), and Cambray (2009). Finally, the Gödel-Turing framework is a key element in the computational strains of complexity theory, like Algorithmic Information Theory (see section 8.3, but also Markose, 2003). In my attempts to link Jung and Gödel I have made the implicit link to this element of complexity theory explicit. Combined these points provide sufficient ammunition to argue overall that the "complex" in complex psychology is closely related to the "complex" in complexity theory.

Still, although the traditional Jungian term of complex is not used in this context, certain dynamics of Jungian complexes approach characteristics associated with complexity, like emergence. Specifically, the interaction of complexes at the micro level gives rise to the endogenous behaviour of complexes at the macro level. For example, personal complexes interact between individuals, but also with cultural complexes (e.g. Singer and Kimbles, 2004). That is to say, the complexes of the individuals mutually influence each other, as these individuals interact, but also influence and are influenced by the complexes of the group they are part of. The nature of that influence, in a composite sense, is thus clearly 'complex' with multiple feedback loops. Moreover, cultural complexes particularly concern conflict between groups. For example, competition for natural resources within the global economy has often been associated with such conflicts, so cultural complexes could apply to

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<sup>97</sup> Jung implicitly referred to the famous butterfly-effect when he stated (CW9i, para. 408): "That the greatest effects come from the smallest causes".

groups of economic agents. But these are just my early reflections and more research is required.

Accepting Jung's preference for the term complex psychology in this manner, I will argue in this section that complexity theory in general, and the Gödel-Turing<sup>98</sup> framework in particular, offer a robust platform of analysis for a more abstract interpretation of his concepts which can contribute to our understanding of the human mind, both at the individual and collective level, as a complex adaptive system (CAS).

Like complexity theory, complex psychology focuses on the unique characteristics which emerge from the dynamics of systems, in this case psychical systems or minds. Examples of archetypal dynamics include differentiation/integration, enantiodromia, and participation mystique. Crucially, the numerical 'coordinate' (or scale) dimensions in which complex dynamics appear (e.g. in space-time: length, breadth, width, and duration) are important (philosophical) considerations when problems of complexity in general are analysed.

What makes complexity theory attractive for both complex psychology and finance is the formal acknowledgement and treatment of 'elusive' macroscopic properties involved in the ordering of a complex system. In an overview, Markose (2005, p. F161) points out that:

In all variants of complex systems theory it is held that macroscopic properties cannot be formally or analytically deduced from the properties of its parts. Methodologically, it is precisely this that distinguishes the sciences of complex systems from the bulk of traditional science which relies on deductive formalistic and analytical methods.

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<sup>98</sup> Also known as the Gödel-Turing-Post framework (e.g. Markose, 2005); sometimes Church is also added, e.g. Church-Turing.

Progress has been made along various lines. Specifically, whereas the original result of Gödel's Incompleteness Theorem was the proof that mathematics was larger than logic, its principles have since been applied elsewhere. In finance, for example, Spear (1989) showed the non-computability of fixed point mappings that represent equilibria in markets, challenging the assumptions of modern finance. As Markose points out, Gödel-Turing's broader relevance is that, to paraphrase Hayek, in the absence of the implied limits on computation there is in principle no reason why all observed price patterns and other economic forms (e.g. innovations) cannot be achieved by a central command.

Although this matter is not settled and divergent views remain, what has become clear in the field of complexity theory over the last few years<sup>99</sup> is, first, that the sine qua non of a complex adaptive system is not the non-linearity or chaos it exhibits but its endogenous ability to internally produce innovations (or novelty) to deal with external surprises. This lies at the core of the system's self-organisation: to realise order in the face of chaos. Second, that the dynamics involve both competition (e.g. the Red Queen principle<sup>100</sup>) and cooperation (e.g. alliances), ultimately realising a unity of opposites.<sup>101</sup> Following Jung I have consequently chosen the term conjunction to capture this, reflecting that the very opposing of its elements is a strengthening merging at the systemic level. So, our conjunction requires an oppositional (or contrarian) structure. Specifically, the conditions of such opposition, combined with the recognition of its existence by each opposing force, can be shown

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<sup>99</sup> My interpretation, but see in particular Markose (2003) and Markose (2005) and the references therein. An early economic perspective is by Hayek (1967) and a modern update is by Arthur (2005). For a more general view see, for example, Mitchell (2009). Finally, a rich source of research is the Santa Fe Institute: <http://www.santafe.edu/research/>

<sup>100</sup> A metaphor for the ubiquitous 'arms race' in complexity. Although some readers may be more familiar with Jung quoting the White Queen in Lewis Carroll's *Through the Looking-Glass*, the Red Queen said to Alice: "Now here, you see, it takes all the running you can do, to keep in the same place."

<sup>101</sup> The oppositional structure plays out at multiple levels and does not exclude cooperation if this improves competitive strength, i.e. former hostiles unite against a common enemy.

to be logically necessary as Kauffman points out: "coevolution of entities which interact with and know one another. The laws which govern the emergence of knower and known . . . lie at the core of the science of complexity" (1991, p. 1). Third, certain properties of this system escape reduction into an axiomatic description and its resulting innovations are beyond algorithmic enumeration. This comes back to reflexivity. In a system where the analysis of a situation is a function of exactly that analysis (e.g. an expectation of its outcome determines that very outcome) there is no logical or deductive way to settle this and some form of meta-mapping is required. As I will discuss shortly, intuition is the mind's way to transcend or break-through this self-referential loop by inviting surprises<sup>102</sup>, the unexpected unknowns. The accompanying experience enriches the analysis with meaning, reaching beyond pure logic. Ultimately, in the words of Derman (2009, p. 5), echoing Kauffman, "intuition is a merging of the understander with the understood".

So, what is the argument to assume that the mind is a complex adaptive system in the first place? In particular what makes up the required oppositional structure and how can the mind endogenously generate novelty, the pre-condition for adaptive self-organisation? The answer lies in the intrinsic opposition between the unconscious and consciousness<sup>103</sup> which is played out in archetypal dynamics: "Logical analysis is the prerogative of consciousness; we select with reason and knowledge. The unconscious, however, seems to be guided by . . . the archetypes" (Jung, 1964, p. 67). Jung saw the relationship between the unconscious and consciousness in similar terms to those of the complex dynamics between

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<sup>102</sup> These surprises are not by definition immediately positive or optimal: they include mistakes and errors. I would also include, for example, fantasy and slips of the tongue.

<sup>103</sup> Here meant in terms of the cognitive and awareness, rather than the experiential/phenomenal.

competition and cooperation.<sup>104</sup> He also emphasised the autonomy of the unconscious and assigned intelligence to it which feeds intuition and even embeds an element of prognostication (ibid, p. 66). More recently Gigerenzer starts his bestseller *Gut Feelings: The Intelligence of the Unconscious* with the following 'Jungian' statement:

We think of intelligence as a deliberate, conscious activity guided by the laws of logic. Yet much of our mental life is unconscious, based on processes alien to logic: gut feelings, or intuitions. . . . We sense that the Dow Jones will go up. . . . Where do these feelings come from? (2007, p. 3)

Consequently, my proposition is, first, that the unconscious and conscious forces can be considered as 'intelligent' agents<sup>105</sup> in terms of the Gödel-Turing framework. In fact, Jung even referred to archetypes as agents (CW7, para. 109). Second, the opposition between these two subsystems (which is almost universally accepted in all dual-system theories of mind) and their mutual recognition *at their own respective level* of this 'hostility', i.e. they agree to disagree, are the necessary conditions for innovative outcomes to adapt and progress in conjunction. According to this view generating novelty is achieved in the form of intuitive insights (e.g. Klein, 2013) and imagination which result in a vast array of symbols: "opposites never unite at their own level . . . since the symbol derives as much from the conscious as from the unconscious, it is able to unite them both, reconciling their conceptual polarity through its form and their emotional polarity through its numinosity." (CW9ii, para. 280). In their very opposing hostile agents or "hostile elements" (CW14, para. 14) unite in the system's broader adaptive purpose to produce novelty. The conjunction of the unconscious and consciousness produces

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<sup>104</sup> The unconscious "is not [just] complementary but compensatory. This goes to show that the unconscious does not simply act *contrary* to the conscious mind but *modifies* it more in the manner of an opponent or partner." (Psychology and Alchemy, para. 26).

<sup>105</sup> To be clear, what I am interested in here is not the substance or form of these agents but their strategies: intelligent agents execute strategies (or fulfil mandates).

their mental child, the intuitive insight, “the birth of a third and new thing, a son who resolves the antagonism of the parents and is himself a ‘united double nature’” (ibid, para. 22).

Specifically, central in complex psychology is the complementarity of opposites (e.g. Atmanspacher and Primas, 2006). This is closely associated with concepts in complexity theory. The first is the limited case of the Boolean True/False logic of the Liar’s Paradox: “This statement is false”.<sup>106</sup> In turn, this was part of the mechanics Gödel used to prove his Incompleteness Theorem which, for example, Robertson (1995) linked to Jung’s archetypal hypothesis. Another is from (algorithmic) information theory and concerns the signal-noise dichotomy as captured in the symbol which embodies both. There are two important points to highlight in this regard.

First, information is always about something and implicitly dynamic. A signal, in that respect, is the intermittent alerting message of a pattern which is ‘in formation’. For example, the message to ‘pay attention’ or ‘be aware’ is one of the signals of the symbol as it emerges in consciousness. Noise, on the other hand, is the ever-present infinite ‘background clutter’ of the unknown, entropy’s perfect disorder if you will. Although a symbol contains some information (i.e. its signalling property) its meaning is discovered, a process which reflects a large part of uncertainty (i.e. chance encounters). In the context of evolution, Damasio (2004) argued that the discovery of new things by chance is required before selection can take place. We can thus state that a symbol is a signal enriched by noise, in the sense that the

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<sup>106</sup> To be clear, following my arguments for why complex psychology can justifiably be linked to complexity theory, I use Atmanspacher and Primas as a reference because they make the link between Jung/Pauli’s complementarity and the Boolean type. I simply suggest that the True/False logic of the Liar’s Paradox is a limited case.

informational tendency, as in 'probability', reflexively emerges from indeterminate randomness. Nietzsche famously remarked that certainty is what drives one insane. Translated in terms of the requirement as a complex adaptive system, the healthy mind has to strategically use, almost embrace, indeterminacy to 'surprise' itself (i.e. with intuitive insights) in order to surprise (hostile) others. In short, inner surprises as a quid pro quo to outer surprises.

Second, although a symbol cannot be fully reduced to a signal we could view the signal as the format with which the symbol is realised physically. Specifically, the physical properties of the symbol include the bio-electric signal which accompanies its emergence in consciousness. This also involves the physical route in terms of neural circuitry along which the symbol's emotional charge will build. I believe this 'road-map' is equivalent to what neuroscientists call "connectivity patterns" which contain "latent knowledge" (Dehaene et al, 2006, p. 209).

Consistent with Jung's interpretation a symbol is signalling information which content is non-exhaustive as far as meaning is concerned because the latter continues to be shaped out of (the interaction with) the unknown. This process of discovery while the symbol is being shaped is experienced phenomenally and takes place as 'life at the edge of chaos'. It signifies Jung's "psychic probability" (1955, para. 964) of archetypes manifesting tendencies by way of living symbols in an otherwise chaotic, seemingly random, environment. This and the selection of contents "best suited to themselves" (CW5, para. 232) is echoed in neuroscience, here emphasising the complementary economic forces at play:

The mistake made by many cognitive scientists is to view symbolic content as static, timeless entities that are independent of their origins. Symbols, like the vortices of the river, may be stable structures or patterns that persist for a long time, but they are not timeless and unchanging . . . the processes that govern how a



pattern is selected from myriad possibilities must be incorporated in any set of organizational principles for living things. These processes often involve *cooperation* and *competition*, and a subtle interplay between the two. (Kelso, 1995, pp. 1, 6)

This setting allows us to explore the special nature of numerical archetypes, the topic of the next section which I would like to introduce briefly here.

Complementarity can manifest itself at various levels. In the mind the complementarity between consciousness and the unconscious involves a psychic polarity or tension which drives the aforementioned dynamics:

Thus there emerges a tension of opposites between the One and the Other. But every tension of opposites culminates in a release, out of which comes the "third". In the third the tension is resolved and the lost unity is restored. . . . There is an unfolding of the One to a *condition where it can be known*—unity becomes recognizable had it not been resolved into the polarity of the One and the Other, it would have remained fixed in a condition *devoid of every quality*. (Jung, 1938, para. 180; emphasis mine)

The polarity of consciousness as the "Other" (or "Two") opposite from the unconscious source of "One" generates the novelty as the "third" which sustains the mind as a complex adaptive system.<sup>107</sup> The Three uniting the One and the Two, in the process enriching the former with quality, leads me to my "strange loop" (e.g. Hofstadter, 2007) depiction of the archetypal experience as an 'Ouroboros chain' of three sections<sup>108</sup>:

1. Unconscious origin (archetype)
2. Cognitive embodiment (functional behaviour, e.g. instincts<sup>109</sup>)
3. Phenomenal culmination (quale)<sup>110</sup>

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<sup>107</sup> To be complete: the zero stands for the unus mundus according to my interpretation.

<sup>108</sup> I basically equate the phenomenal (e.g. A-ha) sensation as the culmination of the tension between the unconscious and the cognitive. The dynamics between these three "mentalities" is a continuous self-reflexive (i.e. discovery) process, akin to an Ouroboric loop, that sustains the mind as a CAS. Still, I acknowledge that some readers may find this attempt to literalize the first three stages of the Axiom of Maria farfetched, or even questionable.

<sup>109</sup> "What we properly call instincts are physiological urges, and are perceived by the senses." (Jung, 1955, p. 58).

The fringes of an archetypal experience both remain outside (as in “escape”) the cognitive domain but meet, like the head and tail of the Ouroboros, in the non-computable ‘discovery’ space of meaning.<sup>111</sup>

These primordial integers and the dynamics they raise involve numerical principles, hinting at the crucial role of numerical archetypes. Pauli (in Card and Morariu, 1998, p. A74) recognised the importance of number intuition as part of “a more general concept of archetype”:

it should be understood in such a way that included within it is the *mathematical primal intuition* which expresses itself, among other ways, in arithmetic, in the idea of the infinite series of integers, and in geometry, in the idea of the continuum.

It is abundantly clear that Jung thought of numbers as the irreducible symbols of the most primordial of archetypes which offer an interface between the unconscious and consciousness:

[If] a group of objects is deprived of every one of its properties or characteristics, there still remains, at the end, its number, which seems to indicate that *number is something irreducible* (CW8, para. 870; emphasis mine).

Shortly before his death Jung handed the limited writings he had collected to von Franz with the suggestion to do more research. From her analyses, as well as those by Atmanspacher, Card, Pauli, Robertson, and others we can conclude:

number is an archetype of order that is in the process of becoming conscious. It is *the most primitive manifestation or the most “seminal” of all manifestations of archetypes or archetypal processes*. (Von Franz, 1992, p. 37; emphasis mine)

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<sup>110</sup> The condition where the archetype becomes known to the extent of its image. Implicit in this interpretation is that the archetype “devoid of any quality” remains in the null state, or zero. That is to say unknown, not even unconscious.

<sup>111</sup> Arguably, apart from first person qualia the property of consciousness as a shared experience, i.e. second person intersubjectivity, also escapes reductionism. See elsewhere in this thesis.

In the following section I show that the primacy of numerical archetypes has now received substantive neuroscientific support.

### 5.3 NUMERICAL ARCHETYPES: AN EARLY NUMBER SENSE

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Numerical archetypes are archetypes which symbolise via numbers, e.g. the natural integers. They are the prime archetypes because they enumerate, both cardinals and ordinals, thereby providing values required for selection, the main dynamic of evolution. Applied to the mind, and in terms of archetypal dynamics, numerical archetypes facilitate the selection by archetypes of “those contents which are best suited to themselves”. In general, numerical archetypes enable the numerical operations required for all archetypal dynamics, typical examples being differentiation and integration, while bridging the mental with the physical.

I thus use the plural “numerical archetypes” not because each number requires an archetype, but because the numerical operations (e.g. biomolecular computation) mandated via archetypes involve multiple numerical archetypes. Their interaction, more than the interaction among any other archetypes, underlies the complexity of archetypal dynamics. It is striking how this is echoed by modern insights: “In nature’s pattern-forming systems, contents aren’t contained anywhere but are only revealed by the dynamics. Form and content are thus inextricably connected and can’t ever be separated.” (Kelso, 1995, p. 1).

In that light, numerical archetypes can be viewed as mandates to exchange values with, and thus influence, the emerging archetypal situation. Specifically, these include the coordinates for archetypal images to emerge in consciousness, i.e. in

space time. Numerical archetypes perform the autonomous valuation of, i.e. attach a number to, our material state (e.g. wealth) as it relates to our mental state (e.g. wellbeing). To make my point in terms of finance I will regularly paraphrase Von Franz: "The question is not what we do with prices, but what they do with us."

In the dynamics between order and chaos, she further observes (1992, p. 36) that "The primary means for ordering something in the chaotic multiplicity of appearance is therefore number." Numerical archetypes reveal, in the most objective shared sense of their symbolism (i.e. Jung's "just-so-ness" of numbers), the hidden order underlying chaos. This "sense" in terms of meaning was expressed by von Franz as follows: "man possesses an unconscious 'numerical sense'" (see full quote below). This description is remarkably similar to "number sense", a well-researched hypothesis within mathematical cognition which focuses on how the brain gives rise to mathematics.<sup>112</sup> Neuroscientist Stanislas Dehaene, one of its leading experts, states that number sense "provides animals and humans alike with a direct intuition of what numbers mean" (1997, p.5). Based on a growing amount of convincing proof (Dehaene, 1997; Butterworth, 1999; Brannon, 2005; Gilmore et al., 2007; De Cruz, 2008; and the numerous references therein) there is a broad consensus on this ability. Moreover, Sklar et al. (2012), in a series of experiments, reported that effortful arithmetic equations can be solved unconsciously. To state the obvious: these findings are highly relevant for investing, as a discipline dealing with numbers. They also confirm earlier reflections not only by Jung, Pauli, and von Franz, but also by Danzig, Hadamard, Husserl, and others:

Most striking at first is this appearance of sudden illumination, a manifest sign of . . . unconscious prior work. The role of this

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<sup>112</sup> It's a term originally popularised by Danzig (1930). However, I do not follow his strict separation between number sense and counting and other higher mathematical functions.

unconscious work in mathematical invention appears to me uncontestable. (Poincaré, n.d.)

Therefore, the following conclusion seems valid: numerical archetypes are an early version of number sense.<sup>113</sup>

It is important to make a distinction between numerical archetypes and the other archetypes. This applies, among others, to the question whether archetypes are innate or emerging 'modules' as well as to the (related) question whether archetypes are domain-specific or domain-general.<sup>114</sup> Based on the aforementioned references we must conclude that numerical archetypes are innate and domain specific. In a summary Dehaene (2001) provides four lines of evidence suggesting that number sense constitutes a domain-specific, biologically determined ability:

1. The presence of evolutionary precursors of arithmetic in animals (p. 4): ". . . evolutionary pressures must have led to the internalization of numerical representations in the brain of various animal species."<sup>115</sup>
2. The early emergence of arithmetic competence in infants independently of other abilities, including language (p. 5): ". . . elementary numerical abilities that can be demonstrated in animals are almost strictly identical to those that have been found in preverbal infants in the first year of life."
3. The existence of a homology between the animal, infant, and human adult abilities to process numbers (p. 6): ". . . two striking shared characteristics of

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<sup>113</sup> The aforementioned sources provide convincing evidence, arguments, and examples to draw this conclusion and I refer to their work for more details. They also provide many additional topics of interest, for example the subitisation limit of 4 which offers a fascinating link to Jung's reflections on the quaternio.

<sup>114</sup> See, for example, Goodwyn (2010) and the responses to him by Knox, Merchant, and Hogenson (2010).

<sup>115</sup> This fulfils the evolutionary continuity requirement, stated for example by Panksepp and Panksepp (2000) in their critique of evolutionary psychology.

number processing in humans and animals have been identified: the distance and the size effect.”

4. The existence of a dedicated cerebral substrate via a specialised circuit in the inferior parietal lobe (p. 8): “. . . two arguments support the hypothesis that the intraparietal cortex of both hemispheres participates in such a circuit. First, neuropsychological studies of human patients with brain lesions indicate that the internal representation of quantities can be selectively impaired by lesions to that area. Second, brain-imaging studies reveal that this region is specifically activated during various number processing tasks. . . . The above discussion should not be construed as a modern defence of phrenology . . . Multiple brain areas contribute to the cerebral processing of numbers.”

Finally, the following conclusion by Dehaene is particularly relevant for numerical archetypes (i.e. “weighing”), respectively for complexity theory in general and Gödel’s Incompleteness Theorem in particular (i.e. “elementary” vs. “derived properties”):

If one had to look for a “primitive” function in the nervous system, it would perhaps be the ability of a nerve cell to recognize an elementary “shape” in its inputs *by weighing* the neural discharges it receives from thousands of other units. The recognition of approximate shapes is an *elementary and immediate property* of the brain, while *logic and calculation are derived properties*, accessible only to the brain of a single, suitably educated species of primate. (1997, p. 234; emphasis mine).

What these modern insights show is that, more than anything, Jung’s conclusion that the numerical archetypes form the prime archetypes is of seminal importance.

Unfortunately Jung was not allowed more time to expand on his preliminary reflections on numbers so a lot of lifting remains to be done. And although von Franz

provided more detailed explorations into the psychic nature of numbers she remained with one crucial empirical issue:

If we apply these reflections of Jung to number, this would mean that number is bound up with the latent material aspect of the psyche and with the latent psychic aspect of matter. *Up to the present time, however, no means of measuring psychic intensities numerically has been envisaged, although I believe such a possibility exists because of the fact . . . that all emotional, and therefore energy-laden, psychic processes evince a striking tendency to become rhythmical.* (Von Franz, 1974, p. 157; emphasis mine)

With this thesis I argue that her search is over, a summarised version of which will follow in the next section (5.4).

Equating numerical archetypes to number sense helps to answer other questions as well. What makes the archetypal images emerge in consciousness in a meaningful way, that is to say a constellation leading to myth formation, dream images, mandala drawings, and other narratives of the unconscious? Why this image, and why not another? In that respect, we can ask what ability facilitates the selection by archetypes of the aforementioned “best suited” contents, the assessment of their space-time location within the archetypal situation, the estimates of Jung’s psychic “probabilities” and their ranking, etc.?

At this point allow me to take a brief philosophical detour, guided by contemporary philosophers like David Chalmers (e.g. 1996), John Searle (e.g. 1997) and Jaegwon Kim (e.g. 2005). In the context of the cognitive domain and causality, to what extent can an archetype’s ability to symbolise be functionalised? If we exclude the end points of the archetypal experience, the midsection of its chain is the cognitive domain which consists of functional links to behaviour. Mental properties and processes like belief, perception and memory have been (or in principle can be) linked to behaviour in a causal way. For example, the expression of this midsection

is in observable instinctive responses. This is crucial because it allows us to search for the underlying biophysical mechanisms for this section. In other words, is there a mechanism as part of numerical archetypes which is causally responsible for transmitting numbers? In philosophical terms, can we identify "realisers" of numerical archetypes? According to Dehaene and others there is convincing evidence that the inferior parietal lobe in the brain is the main physical realiser of number sense and by my extension the numerical archetypes. Thus in that sense the numerical archetypes can be physically reduced. However, the end points of the archetypal experience of numbers, namely the unconscious origin as well as the phenomenal culmination, resist this reduction if only because they have to in order for the experience to achieve its adaptive impact. In the Gödel-Turing framework the mind computes but not all of its understanding is computable. To the extent that the mind computes, its computational algorithms involve mathematics. Like all of mathematics, its ultimate foundations (Dehaene, 2001, p.2) "rest on core representations that have been internalised in our brains through evolution." Where the mind exceeds computation, that is to say where the mechanical operations do not exhaust the understanding of meaning, is in our intuitions of numbers which order, among others, those very operations. As Gödel stated: "the solution to certain arithmetical problems requires the use of assumptions essentially transcending arithmetic" (1964, p. 121). Referring to Skolem and Peano's first-order arithmetic, Dehaene (1997, p.240-241) argues that "our best system of axioms fails to capture, in a unique way, our intuitions of what numbers are . . . Hence, our brain does not rely on axioms." In short, to innovatively deal with surprises the unconscious and phenomenal properties of intuition need to escape reduction into an axiomatic system. Like its environment, the mind needs to conceal its surprise element in



order not to become predictable. I will repeat this message later as applied to price discovery.

Back from our detour, numerical archetypes facilitate broader archetypal dynamics which eventually lead to an 'ordered' (or balanced) mind in healthy human beings. For example, the transcendent function which Jung used to "identify the process by which conscious and unconscious attitudes are compared and integrated" (Knox, 2004, p. 11) implicitly requires numerical attachments to its operation. To be precise, if the transcendent function involves "appraisal and comparison" (ibid) this suggests it is a process which is in essence *numerical*: making a distinction within a (limited) set which, in turn, implies counting (e.g. up to two in case of a distinction between 1 unconscious and 1 conscious attitude). I would go as far as to suggest that it requires benchmarks, triggers, and similar *numerical parameters* for its broader operation, e.g. to keep track of its progress. Another example is the realisation of the ego or self-image which includes receiving its coordinates in space-time, e.g. "Where am I located within the larger whole?" Without repeating other philosophical (e.g. Kantian) issues involved in this, it is reasonable to assume that we intuit those coordinates for the benefit of our own coordination and that they, conceptualised in consciousness, consists of numerical values. Even at the level of micro-organisms such awareness involves counting:

Processing in a bacterium may be thought of as a sort of molecular polling: . . . the positive "votes" cast by receptors in response, say, to increasing concentrations of a sugar are matched against the negative votes produced by increasing concentrations of noxious compounds. On the basis of this continuous voting process, the bacterium "knows" whether the environment, on the whole, is getting better or worse. The results of this analysis appear to be communicated by electrical signals to the response centers. (Keeton and Gould, 1986, p. 452).

Whatever the exact type of “analysis” that leads to the bacterium’s “knowing”, it is clear that some rudimentary, non-conceptual form of counting is involved to “cast votes”. In other words distinction, appearing at a time when consciousness “did not *think*, but only *perceived*” (Jung, CW9i, para. 69), leads to counting, the most basic numerical operation.<sup>116</sup> Elsewhere von Franz links this to the final elementary level of quantum physics using the aforementioned “numerical sense”:

Physicists nowadays sometimes speak of a “protoconsciousness” in inorganic matter. I would propose saying that this protoconsciousness consists in “knowledge how to count” . . . man possesses an unconscious “numerical sense,” and this is probably the sense that subatomic particles possess. (1992, p. 256)

Like many physicists, Pauli was fascinated by the fine structure constant (see Miller, 2009). Its value (1/137) does not appear to be caused or determined by any (other) law of nature. In fact, together with the electron to proton ratio it influences the causal powers of all atomic and molecular bodies. It is striking that both are, again, ratios. Moreover, on the one hand there are causal processes in the actual world that involve these numbers while, on the other hand, there are possible other worlds where the causal processes are different because of variation in the values of these numbers (Seager, 2014, p. 167).

In the final analysis numbers, employing Leibnizian terminology, refute the principle of sufficient reason because there is no reason (or cause) for their values simpler than themselves. This quality confirms the crucial irreducible role of numerical archetypes as suspected by Jung. Beginning with intuitive insights, numbers form the skeleton of discovered symbols and patterns. As the most basic quality of everything, there thus has to be an archetypal underpinning for number. In terms of mental efficacy, numerical archetypes, symbolised as numbers:

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<sup>116</sup> See also Robertson (2000).

possess a dynamic, active aspect which is especially important to keep in mind. It is not what we can do with numbers but what they do to our consciousness that is essential (von Franz, 1974, p. 33).

This 'luminosity of numerosity' has also received support by Burr and Ross (2008, p. 426) who extend the concept of qualia to numbers.

## 5.4 PRICE DISCOVERY: NUMERICAL ARCHETYPES IN CAPITAL MARKETS

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As suggested by von Franz (1992, p. 57), "Perhaps I should complete this [chapter], which has been mainly formulated with the thinking function, with a hint as to what this could mean from the standpoint of the feeling experience." It acts as a taster for chapter 8.

I am not a Jungian (thank God, Jung would say) but an investor (he did suggest to visit "Stock Exchanges"). My research is therefore not based on therapy sessions but rather on my experience in and with capital markets. Emotions and other psychological phenomena have not been revealed to me by patients lying on a couch but by my own and others' participation in markets when we collectively respond reflexively to prices. So allow me to express, to paraphrase von Franz, what prices do to our consciousness.

The archetypal experience of investors is called price discovery. It is archetypal because it involves today's survival in the economic jungle while being confronted by (the uncertainty of) the unknown, among others triggering instinctive responses. Specifically, the numerical archetypes, far from being obscure, play a central role in

ordering the financial system which, whether we like it or not, is at the heart of modern society.

From its barter and credit origins, trading is exemplary for human exchanges. A trade is the exchange of a number of units of one item for a number of units of another item. That ratio is the price and reflects the numerical archetypal essence in trading, including the embedded tension from the oppositional forces of supply and demand. The archetypal dynamics reach higher levels as prices are compared among each other as part of the discovery process. As a reminder, a trade occurs in the physical domain (assuming at least one item is a good) as well as the mental domain (an agreement on relative worth). Usually, one of the items is money (sometimes credit) which facilitates trade more efficiently than barter. (In section 8.2 I will discuss ratio from a different but related angle).

Price discovery is an Ouroboric loop originating in numerical archetypes and culminating in price qualia. I argue that capital markets provide von Franz's "means of measuring psychic intensities" at a collective level and that price discovery is Pauli's "symbolic, psychophysical unitary language" spoken at a massive global scale. Among others, as symbols prices capture the duality between rational and emotional expectations, each providing (often conflicting) utilities. Ultimately prices and their patterns<sup>117</sup> are the market's symbolic reflection of constellations of numerical archetypes as they bridge the collective investor psyche with the physical real economy. They often anticipate (i.e. discount) outer events in the real economy which, via confabulation, receive their "bullish" or "bearish" meaning in fundamental

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<sup>117</sup> Among these are so-called technical patterns which have repeated themselves over the history of capital markets. They have names like "head and shoulders", "island reversal", and "saucer bottom", each with a story to tell. They also include cycles and waves, often scaled according to the Fibonacci ratio.

terms<sup>118</sup>. Although causality in this composite CAS remains elusive, its dynamics can lead to the build-up and shattering of investment myths which has been clearly shown in the many bubbles and crashes over the past centuries (e.g. Kindleberger and Aliber, 2011).

Crucially, numerical archetypes and price qualia both escape scientific description. So, in the final analysis I cannot convey to you, the reader, the combined primal awe and phenomenal intimacy of experiencing the market as it makes up its mind, sometimes violently so:

I don't know how to explain it. It's so wild. If a guy sees it *who's not in it*, all he could say is, "They should be locked up!" It's so violent when it takes off. It's violent, the power of the market . . . when it starts moving. . . . *You've got to be in it all the time to know* where the market is, you've got to have a position. (Hassoun, 2005, p. 107-108; emphasis mine)

In broader terms, mesmerised by prices the market's participation mystique is expressed in the following words of another anonymous trader:

You are part of the market, you notice every small shift, you notice when the market becomes insecure, you notice when it becomes nervous, you notice the strong demand . . . All this (amounts to) a *feeling* . . . When someone *feels the market*, then they can anticipate (it) and can act accordingly. (Knorr Cetina and Bruegger, 2000, p. 153; emphasis mine)

With price discovery ordering the market's mind, the individual trader's search for 'peace of mind' is a search for 'true value' while engaging the collective market psyche. At that level, price discovery is most powerful when it is experienced as an intuitive insight, in the immediate moment of a trade 'aligned with the market', while often going against the crowd. There are suggestions that there may be a way to

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<sup>118</sup> In case the reader has not recognised these already, examples of opposing forces in the market's mind are sellers vs. buyers, bulls vs. bears, longs vs. shorts, but also regulators or central bankers vs. speculators.

more directly tune in to this collective consciousness in order to understand the symbolic meaning of prices:

Every market has a rhythm, and our job as traders is to get in sync with that rhythm. I'm not really trading when I'm doing those trades. There's trading being done, but I'm not doing it. . . . There's buying and selling going on, but it's just going through me. It's like my personality and ego are not there. I don't even get a sense of satisfaction on these trades. It's absolutely that objective . . . There is no sense of self at all. There is just an awareness of what will happen. The trick is to differentiate between what you want to happen and what you know will happen. The intuition knows what will happen. In trading . . . whenever there is effort, force, straining, struggling, or trying, it's wrong. You're out of sync; you're out of harmony with the markets. (Schwager, 1992, p. 412)

The quality of the experience of such price dynamics extends to its duration, something others have called intrinsic time:

Researchers have traditionally analyzed the responses of traders in physical time . . . Such an approach does not adequately reflect the subjective experience of time . . . [Instead] intrinsic time weights chronological flow according to price action: during highly volatile periods time is expanded; during quiet periods, when market volatility is low, time is compressed. (Olson, 2004, p. 4)

It is in that "flow" state that calendar time ceases to exist, as does the separation between the trader and the market, a separation of observer and the observed. In that moment, the individual trader identifies himself with the market, which most traders view as a "greater being" (Knorr Cetina and Bruegger, 2000, p. 149). Other comments indicate that being in tune with the market brings clarity and focus. In other words, the market is 'like' an entity which is doing something to the individual who is engaging it. When describing the more painful experiences with the market the terms used are quite Freudian: "I got shafted, I got bent over, I got blown up, . . . I got stuffed . . . I got hammered, I got killed." (ibid, p. 156). Similar findings have been reported by others (e.g. Zaloom, 2006).

When Jung talks about the mind as an ordering faculty to bridge the physical and mental worlds, he echoes the words of Hayek (1952, p. 46), one of the few economists who reflected on the mind's workings. With fractal scaling in mind, so abundantly observable in nature, it is no coincidence that the collective market mind has evolved to become the ordering faculty for the global economy, allocating its resources. The market's states of mind, intersubjectively experienced via prices by investors, are often elevated to "hyperexcited states" (von Franz, 1992, p. 27). This can be extended to portfolio management, e.g. the risk of obsessed single-mindedness is comparable to the risk in a concentrated portfolio containing a one-sided bet (see also chapter 9).

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## 5.5 CONCLUSION

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Based on the Gödel-Turing framework and from a Platonic viewpoint Penrose argues that the human ability to understand is achieved by some non-computational activity (1995, p. 48).

That activity, I argue, is the discovery of meaning grounded in number intuition of which the numerical archetypes are the unconscious source. Numerical archetypes are the origin for ordering archetypal dynamics involved in the archetypal experience. If patterns, like archetypal images, are ordered themselves they can in principle "be grasped by a numerical procedure" (von Franz, 1992, p. 47) which, in turn, can be "stored as some sort of numeric algorithm" (Robertson, 1992, p.49). At their core, "deprived of every one of its properties or characteristics", what remains is their numerical profile, their constellation according to numerical archetypes, which has no reason, nor meaning, simpler than itself. Numbers are implied in

understanding the archetypal experience. Intuitive meaning makes discovery a seeking rather than a finding process. Every now and then we make quantum leaps but often the Red Queen prevails!

Now that the groundwork has been prepared and the foundation has been laid the hypothesis will be defined in the next chapter.



## CHAPTER 6. HYPOTHESIS

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*But notwithstanding the advance in physiological knowledge, we do not know more about the mind-body problem than the old philosophers who first began to ponder it . . . Thoughts and ideas are not phantoms. They are real things. Although intangible and immaterial, they are factors in bringing about changes in the realm of tangible and material things.*

Ludwig von Mises

### 6.1 INTRODUCTION

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In the previous chapters I indicated how recent events in the capital markets add to the pressure to redefine the paradigm of finance. I also explained archetypes and the collective unconscious as the main concepts of complex psychology, as well as the primacy of numerical archetypes. Finally, I discussed the phenomenon of consciousness, both at the individual as well as the collective level. This was all in preparation to the formulation of my (working) hypothesis, called the Archetypal Market Hypothesis (AMH), which is the topic of this chapter.<sup>119</sup>

AMH views the market as an animated entity, closer to being an organism than a machine. In that respect, the link between biology and economics is strong.<sup>120</sup> This was recognised by the biologist Stephen Jay Gould, for example, when he argued that Charles Darwin's theory of natural selection "is, in essence, Adam Smith's economics transferred to nature . . . Reproductive success becomes the analogue to profit" (2002, p. 122). John Maynard Keynes argued that "the economic problem, the struggle of subsistence, always has been the most pressing problem . . . not only of the human race, but of the whole of the biological kingdom from the beginnings of

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<sup>119</sup> Elements of this chapter were previously published in Schotanus (2014) and Schotanus (submitted).

<sup>120</sup> There are numerous interpretations of (the links between) economics and evolution. For example, for markets as ecosystem, see Lo (2004). For the implications of evolution as computation, see Beinhocker (2011). For a Darwinian view on economics, see Hodgson (2002). Last but not least, for an example of economic evolution focussing on the human mind, see Loasby (2005).

life in its most primitive forms" (1930, p. 361). Competition and cooperation are opposing phenomena that feature prominently in economics and are applicable to evolution. Survival by the human species, in its search for limited resources, benefitted from individual competition encoded in the post-Darwinian "selfish" gene (e.g. Dawkins, 2006) as well as from collective cooperation. The latter is not only embedded in norms and morals of groups (e.g. Shermer, 2009) but also institutionalised in functions (e.g. Searle, 2005). Shermer also argues that human exchange via trade preceded political alliances. It is an integral component to establishing trust between strangers that lessens the potential volatility that naturally exists whenever groups come into contact with one another, especially over the allocation of scarce resources. As aforementioned, this is particularly the case considering that credit, which is only extended if one trusts those who promise to pay later, formed part of those earliest trades. From a neuroscientific perspective, Kelso (1995) focuses on how competition and cooperation coordinate human behaviour. For example, it involves compromises between competing and cooperating interests. Johnson (2014) points to the overemphasis in economics of competition and argues that reciprocity is a foundation of financial economics.

Within this evolutionary biological setting, AMH takes a mind-body perspective of markets, in particular the postulate of the market's mind which is the implicit premise in any discussion on whether the market is rational or not. Still, its implications, in terms of ontology and epistemology, are hardly understood. In particular, this chapter defines the market's version of the mind-body problem and labels it as finance's "hard" problem. Addressing this problem is one of the key messages of this thesis. Its denial by modern finance causes this dominant paradigm to fail in dealing with reality in general and to produce incomplete investment

knowledge in particular. Finally, as part of facing up to this problem, this chapter offers a glimpse at a practical approach which may enrich investment research, leading up to a proposal for an experiment in chapter 10.

## 6.2 BACKGROUND

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Triggered by the recent financial crisis, questions have been asked about the underlying theoretical framework or paradigm (Kuhn, 1962), with which we analyse economies and capital markets. In light of the systemic characteristics of this crisis, which go beyond anomalies, one could argue like Greenspan (2008) that “tweaking the models” will not do. In fact, what may be required is revisiting the assumptions underlying finance in terms of the implicit ontological and epistemological claims.

Therefore, in the spirit of Benjamin Graham, I am left to ask “What about the mind of Mr Market?” Specifically, I discuss in this chapter the proposition that the market manifests a (collective) mind which echoes, for example, Smith (1981), Soros (1987; subtitle), Knorr Cetina and Bruegger (2000, p. 150), Sornette (2003, p. 241), and Shermer (2009; p. xiii). This philosophical approach is less fanciful than it might seem. Apart from these references it is implied in any discussion on whether the market is rational or not (e.g. Rubinstein, 2001), let alone whether Mr Market suffers from bipolar disorder (Cheung, 2010). However, there are consequences of accepting this as a premise that are often neglected. One beneficial consequence is that one avoids the ontological trap of stating that the market is ‘something altogether different in nature’. Other consequences, on the other hand, seriously question certain investment practices, particularly those that are aimed at repressing market induced psychology. Should the market’s fear itself be feared? Do we really gain a better understanding of the market’s emotions if we repress our own, for

example by outsourcing investment decisions to algorithms? The mind sciences have made clear that emotions and other sensations are crucial for our capability to relate to 'other minds'. We can use those insights to focus on the epistemological issues facing finance in understanding the market's mind. Specifically, are existing investment analysis methods<sup>121</sup> properly suited to study the recurring and often contagious market sensations which vary from despair to exuberance? In short, is it worth it to put all our resources in gaining analytical investment knowledge at the expense of experiential investment knowledge?

These are the main questions I will address. Among other conclusions, I argue that modern finance denies the market's mind-body or "hard" problem<sup>122</sup>. This problem is particularly difficult for finance because it concerns both theoretical as well as practical challenges. The former relate to thorny philosophical issues involved in considering the market as a mind, in particular comprehending the intersubjective experience which completes its state. Ignoring the experiential dimension of price discovery, varying from the individual pain of a loss to the shared sense of panic, is the primary cause for the shortcomings of modern finance and, by extension, its practicing followers. This leads to the practical challenge of having to use unconventional research methods to explore this dimension and uncover its patterns.

The purpose of this chapter is primarily to highlight and explain this problem rather than offer an immediate solution. Although paying attention to 'mind matters' cannot itself offer solutions, it can help define the proper domain of empirical finance. As aforementioned, in chapter 10 I will suggest a framework for a proposed experiment

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<sup>121</sup> Regardless of whether they are fundamental, technical or quantitative.

<sup>122</sup> See chapter 4: it is also known as the mind-matter or mind-brain problem, as well as the problem of consciousness. The term "hard" problem originates with Chalmers (1995).

to test a so-called human perceptual tool. This software is in development and could complement existing analytical investment tools. The aim is to enrich investment research in the sense of extracting more meaning from market data as communicated by Mr Market.

In the next section I will explain how theories transform and discuss market causality, leading up to the proposition of the market as a mind. It is followed by a short section introducing a simple framework to think about its body as well. From this I state finance's hard problem. I conclude this chapter with some closing remarks.

### 6.3 FROM ANOMALIES VIA REALITY CHECKS TO MARKET CAUSALITY

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It is generally acknowledged that both economics and finance have been inspired by the natural sciences, in particular physics.<sup>123</sup> That inspiration has been criticised by many, including Hayek (1974) and Soros (2010) who perceived it as bordering on the obsessive. Echoing Soros, Lo and Mueller (2010) have also argued that modern finance suffers from "physics envy". As aforementioned, I call it a 'physics complex'. I will point to certain complications involved in this disorder by placing modern finance in the broader context of the mind sciences. These have undergone their own transformation which, at the very least, nuances pure physicalism.

Coming back to reality checks (see section 2.3), these have an experiential impact similar, for example, to that which quantum effects had on Einstein. In light of

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<sup>123</sup> Preda (2005, p. 152) argues that already from the 1850s ". . . Engineers transfer the vocabulary of physics to the valuation of railway securities. They require observation and analysis in this process. Sheer luck or emotions are seen as irrelevant."

recent events why does this sound so familiar to investors, particularly those relying on modern finance for explanations? I would argue that the turmoil in the capital markets surrounding the Lehman collapse in 2008 qualifies for such a reality check in finance.<sup>124</sup>

More than anomalies these events reveal the true vulnerability of current thinking in finance. Despite accepting the relevance of rationality, emotions, heuristics, and even animal spirits, it fails to address the existential questions raised by the mind sciences, particularly regarding consciousness in which these psychological dynamics are embedded. Specifically, with its roots in physicalism modern finance has its own form of objectivism: the assumption that price discovery and the creative act of trading can be *separated* from the actual markets, i.e. equilibrium is an independent mechanical process operating in the steady state of rationality. Arguably separateness continues to linger and is, to some extent, appropriate for the natural sciences<sup>125</sup> but it simply is not applicable to understanding markets because the physical market, e.g. the 'real' economy, is intricately linked with the psychology of the collective.

This touches upon one of the main topics in the mind sciences, namely mental causation.<sup>126</sup> As aforementioned, it simultaneously places a finger on one of the raw nerves of finance. Research attempts to identify fundamental causes for mental reactions as reflected in price moves in capital markets. But such macro and microeconomic fundamentals do not convince as the explanatory source for the market's driving forces. Indeterminacy is always lurking around the corners of the financial system. It becomes problematic, for example, if models start to shape the

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<sup>124</sup> See also my article "[Lehman's Lesson](#)".

<sup>125</sup> Along the lines of "The laws of nature do not depend on human knowledge and behavior."

<sup>126</sup> Also known as downward causation of consciousness, e.g. Sperry (1965), Popper (1953).

objects they are supposed to only describe objectively, something economic sociology calls performativity.<sup>127</sup>

These difficulties lay bare the epistemological, if not ontological, issues involved in markets. They demand of finance a premise which, at the very least, reflects an acknowledgement of these issues. Perhaps surprisingly, such a premise already implicitly exists.

## 6.4 THE MARKET'S MIND: A COLLECTIVE CONSCIOUSNESS

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It is perhaps fruitful to find common ground from which to grow new thinking in finance. Despite their differences, the main academic factions studying finance<sup>128</sup> all seem to agree on one thing: capital markets form a complex composite of a large number of interacting human minds whose mentality is ultimately reflected in prices and their patterns. In terms of thinking, for example, I specifically do not want to discuss at this stage whether this is rational or not. Neither do I wish to make the distinction between discretionary thinking, expressed in manual buy or sell orders, and mechanical thinking, expressed in coded orders via computer algorithms. Instead, what is crucial for now is that this agreement ultimately leads to the following main proposition:

### CAPITAL MARKETS MANIFEST COLLECTIVE CONSCIOUSNESS

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<sup>127</sup> From the angle of complexity economics, Arthur et al. (1997, p.20) express it as follows: "the expectational models investors choose affect the price sequence, so that . . . their . . . very choice of models affect their data and so their choices of model."

<sup>128</sup> Apart from modern finance and behavioural finance we can include, in particular, neuroeconomics, econophysics and economic sociology.

I call this collective consciousness the 'market's mind', a familiar term used by investors.

Let me specify further the sub-assumptions underlying this statement

- The investor's mind is a complex adaptive system at the microscopic level (e.g. Edelman and Tononi, 2000; Kelso, 1995; Morowitz and Singer, 1995). It results from the interaction of its bodily neural components, primarily the physical brain, while simultaneously interacting with its environment, in particular other minds in the market.
- The investor's mind exists and is experienced as real at the individual level. Specifically, the interiority of the investor's mind, i.e. the subjective experience of consciousness, is arguably the most unique among its emerging properties. For the individual investor this experience is not an illusion but a phenomenal fact with distinct intrinsic quality: it really feels something to participate and be invested in the markets. By taking an investment position (i.e. long, short, or flat) an investor puts his 'skin in the game' and the outcome of such a trade matters to him. In the spirit of both James (1890) and Nagel (1974), the first person perspective matters because there is something it is like to be an investor.
- But the investor's mind is not isolated from its environment, in this case capital markets which embody millions of investors' minds, directly or indirectly. Their deliberations (e.g. by discussing themes), interactions (e.g. by way of trading) and interconnections (e.g. via computers) create a composite investor mind, a complex system at the macroscopic level. This composite mind evaluates physical events and objects in the real economy, and reflexively expresses its mental responses (i.e. valuations) symbolically,



namely in prices<sup>129</sup> and their patterns. Consequently, it exhibits mental states which are expressed via price constellations. These states capture the intersubjective essence of the market's mind: by way of price dynamics they are experienced collectively by investors as shared sensations, with varying degrees of uniformity in those experiences. This adds the plural first person perspective, or rather the second person perspective (e.g. Hut and Shepard, 1996; de Quincey, 2005), over and above the (singular) first person perspective.

- Moreover, the regular uniformity in the responses themselves, across time and locations, suggests both a common primordial source, as well as a shared singular culture. In other words, nature and nurture complement each other and their influence is broadly the same for all investors. In the words of legendary trader Jesse Livermore: "Nowhere does history indulge in repetitions so often or so uniformly as in Wall Street. When you read contemporary accounts of booms or panics the one thing that strikes you most forcibly is how little either stock speculation or stock speculators today differ from yesterday. The game does not change and neither does human nature." (Lefèvre, p. 180)

According to this proposition then, a 'state of the market' ultimately includes a collective mentality. In particular, prices embed market states, whereby the word "state" should not be interpreted as static but rather as a condition that has internal dynamics. Certain characteristics of a market state concern physical processes, like transfers, flows, and production, involving physical parts, like buildings, machines

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<sup>129</sup> As well as other (derived) data like volume, open interest, returns, flows, etc. Still, the 80/20 rule applies here, in the sense that prices make up 20% of the data in markets but contain 80% of the information.

and products. Others concern cognitive processes like decision-making, discounting and utility maximisation. Although these processes can be analysed they do not describe the full market state. There is something in addition: *how it is like* to be in that state for investors *as (part of) a collective*.

The mind sciences make a distinction between cognitive and phenomenal properties of consciousness.<sup>130</sup> Consequently, the literature distinguishes access consciousness from phenomenal consciousness. To put the latter in more familiar (albeit simplified) terms, the market's mind also exhibits a mood, a sensation investors collectively experience in a qualitative sense, like despair in a market crash or exuberance in a bubble. Although a complete perception of the market's state escapes them, a certain feeling for it seems to agree with how investors actually experience it, as expressed earlier by an anonymous trader, i.e. "All this amounts to a feeling".<sup>131</sup> This is one level of complementarity which applies to the market; its processes are accompanied by an experience, a feeling shared among participating investors, albeit at varying degrees of uniformity.

Following on from chapters 1 and 4, various researchers have argued (implicitly or explicitly) that consciousness in general has indeed a collective dimension. Plato, Durkheim and Nietzsche, while representing different view-points, argued for the collective aspect of consciousness, with Le Bon and Jung pointing to its unconscious origin.<sup>132</sup> Contemporary philosophers (e.g. Hut and Shepard, 1996; Mathiesen, 2005) have followed up with similar arguments as have neuroscientists (e.g.

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<sup>130</sup> Synonymous terms for cognitive are psychological and intentional, whereas sensory is a synonym for phenomenal.

<sup>131</sup> Similar findings have been reported, for example, by Schwager (1995), Koppel (1996), and Zaloom (2006).

<sup>132</sup> Other sources include Martin (1920) and Freud (1921).

Edelman and Tononi, 2000).<sup>133</sup> More intriguingly, other researchers in finance have hinted at this phenomenon in the market. According to Sornette (2003, p. 241) it originates:

from the fundamental nature of human beings, including our gregarious behavior, our greediness, our instinctive psychology during panics and crowd behavior and our risk aversion. The global behavior of the market . . . is reminiscent of the process of the emergence of intelligent behavior at a macroscopic scale that individuals at the microscopic scale cannot perceive. This process has been discussed in biology . . . in connection with the emergence of consciousness.

As indicated in chapter 4, where I started to build my case, I will now round it up by arguing more formally how markets comply with a specific set of criteria required for collective consciousness. Moreover, I will explain why capital markets are so unique in that respect.

In order to clarify further why and to what extent capital markets manifest collective consciousness I like to apply the framework provided by philosopher Kay Mathiesen (2005). She defined three conditions that any account of collective consciousness needs to meet. It allows me to promote markets as a strong contender.

1. **Plurality:** a collective consciousness “must be composed of a number of separate centres of consciousness, which are not directly accessible to each other” (p. 237). In the market the multiple conscious subjects consist of investors. At the macro level all investors together make up the market. At lower levels of aggregation, investors form groups (or crowds, or herds), often identified by colourful terms like ‘bulls’, ‘bears’, ‘hedgehogs’, and ‘sheep’. In both instances they do not have direct access to each other’s consciousness. In brief, investors form each other’s “indeterminate others” (“unbestimmte andere”;

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<sup>133</sup> More popular sources include Rheingold (2002) and Surowiecki (2004).

Heidegger, 1979, pp. 261) whose conscious presence is ultimately felt via price dynamics.

2. **Awareness:** a collective that manifests consciousness “must have collective awareness and genuine intentionality” (Mathiesen, 2005, p. 240). The power of the market’s mind is to represent an economic state of affairs. Specifically, in the market’s mind securities are valued. Although this is the interpretation for the philosophical meaning of intentionality, I also want to say something about intentionality in the general sense. Collectively investors have the same ultimate goal, namely to grow wealth. Or, to put it more bluntly, to make money, i.e. to trade profitably. However, since every trade has a buyer and a seller, not all will achieve this goal (at least not viewed on a per-trade-per-period basis). Goals or wishes can also differ between groups, e.g. bulls (bears) want to see the price going up (down). In addition, investors invest in a variety of securities within and across markets, as well as over time. Securities being shared objects of attention the extent of awareness across these can consequently differ. Still, and importantly, price moves are suggestive for the growth, respectively decline in overall wealth as well as the overall broader intentionality of markets in terms of resource allocation, e.g. whether there is a preference for (e.g. the safety of) gold over (e.g. the industrial usage of) silver. In markets collective awareness and intentionality is thus reflected in prices which investors observe, both historically and in real time. In brief, although no individual investor is completely knowledgeable about the underlying drivers they are all aware of the (intentional) state of the market as reflected in these prices. There is also an implicit acknowledgement of superior knowledge at the market level as far as intentions for the system as a whole is concerned: “You know it’s an invisible

hand, the market is always right, it's a lifeform that has being in its own right. You know, in a sort of Gestalt sort of way (...) it has form and meaning . . . a greater being." (Knorr Cetina, 2003, p.12)

3. **Collectivity:** "In order for collective consciousness to be genuinely collective, it must be something that persons share and that ties them together" (Mathiesen, 2005, p. 241). Investors share the market state, its complete mentality (expectations, emotions, etc.), as reflected in the constellation of its prices. This state is a composite state, independent from the mental state of any individual investor, although they can correlate depending on (the holdings in) the portfolio of the individual investor. The uniformity of feelings is strongest in cases of extreme price moves. For example, in March 2009 all investors shared in the move towards the symbolic 666 in the S&P500 index which indicated, among others, a deteriorating outlook for the US economy. Although the subjective feelings varied across investors, again depending on how their portfolios were made up, the overarching mood was one of extreme worry because of the potential implications of a complete collapse of the financial system. In a 2013 article, called [Lehman's Lesson](#), I described it as follows: "Regardless of whether you were a bull or a bear, we all became rabbits caught in the headlights of the events surrounding [Lehman's] collapse . . . what came over us was the shared sensation of paralysis which accompanied the market seizing up. It was this overwhelming experience that impresses how it is like to collectively be in such an existential market state as humans."

Interestingly, on this last feature of collective consciousness, i.e. collectivity, Mathiesen refers to Edmund Husserl and wonders:

While Husserl does say that these social subjectivities arise out of the 'intercommerce' between the individuals, he does not describe exactly how the attitudes and activities of individuals mesh to form such personal unities. How do the separate individual subjectivities coalesce to produce a shared social subjectivity? (p. 243)

In answering this question she overlooks the hint she herself gives in the quote above which leads us to markets: Husserl's "intercommerce" is very appropriate because it consist of trading, the physical execution in an exchange. Price discovery (i.e. "attitudes") and trading (i.e. "activities") lead to the composite expression of individual mentalities, the "mesh" that forms Mr. Market, the name investors give to Mathiesen's "collective subject" (p. 235). Again, this phenomenon is perhaps best captured by repeating the words of the anonymous trader:

You are part of the market, you notice every small shift, you notice when the market becomes insecure, you notice when it becomes nervous, you notice the strong demand . . . All this (amounts to) a feeling. (Knorr Cetina and Bruegger, 2000, p. 153)

On that note, previously I argued that the cognitive and physical processes in markets can be analysed but that they do not describe the full market state. There is something in addition, namely what it is like to be in that state for investors as (part of) a collective. Accordingly, a market state, over time and expressed in prices, reflects collectively realised information in both the physical and phenomenal sense. Specifically, each representative agent reflexively experiences that market state intersubjectively through prices. As a refresher, EMH<sup>134</sup>, for example, states that the prices of stocks, bonds, and other securities fully reflect all available information at any point in time. In investment parlance, news is almost instantly 'discounted' in prices, regardless whether it concerns economic, political, or other events. This is the result of rational, profit-maximising investors searching for data that informs

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<sup>134</sup> For purists, I take its strongest form, i.e. there are weaker interpretations of EMH. For an early exposition, see Fama (1970).

their knowledge, expectations, and decisions. This is particularly important in the context of philosopher David Chalmers' statement concerning the mind-body problem:

We can also find information realized in our phenomenology . . . And when an experience realizes an information state, the same information state is realized in the experience's physical substrate . . . We might even suggest that this double realization is the key to the fundamental connection between physical processes and conscious experience. We need some sort of construct to make the link, and information seems as good a construct as any. (1996, pp. 284-286)

So, by considering prices as informational building blocks we can be more specific in terms of a potential "construct". In fact, the practical message of this chapter for mind sciences is that capital markets provide insights in the elusive collective dimension of human consciousness, backed up by large amounts of empirical data waiting to be further explored *from this perspective*. That is to say, market data has so far primarily been analysed by finance researchers from the perspective of the market as a physical system, i.e. a machine, using the natural sciences, particularly physics, as a template.

Finally, there may seem to be other candidates for accounts of collective consciousness. Perhaps some will argue that the internet in general and social networks in particular form more convincing cases. However, compared to markets they miss a clear and objective expression of the qualities which make the "psycho"-part complete in terms of phenomenology. Albeit in varying shades of uniformity, those qualities are properties of shared experiences. They should particularly convey a shared meaning in the context of survival of the collective subject, i.e. felt qualities in an existential sense. The expression should be in a format that is uniformly understood, ideally reflecting values which allow scaling of the shared mentality concerning the overall state of the collective subject, e.g. from despair to

exuberance. As aforementioned, such an expression should also indicate intentions, in particular in terms of a commitment to (as in 'valuing') a resource in order to survive under circumstances which mostly are constrained. So, whereas 'tweets' on Twitter and 'updates' on Facebook remain largely individual expressions of emotionally charged events, e.g. 'I am afraid', we are instead looking for a collective expression which genuinely captures the intersubjective intensity of a feeling, e.g. 'we are afraid', by way of an objective measure. It should not be limited to a predefined group but potentially involve the human race while stripped of as much individual subjectivity as possible. I hope I have made clear that capital markets by way of pricing do meet these requirements which make them unique.

So if my thesis is correct, i.e. the market is conscious, what does that tell us about it that we didn't already know? How far reaches the mind-body perspective, e.g. is the market 'alive'? Although the market does not procreate in the biological sense, it does spawn the mental insights which facilitate the creations that support our own biological procreation. It achieves this by way of price discovery which is a creative process in and of itself involving a collective 'effort' by humans, supported by physical tools, which extends their individual mentality. It leads, in particular, to a valuation of 'physical' discoveries (e.g. technological breakthroughs) and resources that cannot be computed by individuals and a global order that cannot be organised via some central control. Evolutionary psychologists Tooby and Cosmides take the following perspective on the dynamics of complexity involved:

There are tight causal and analytic connections between economics, psychology, and evolutionary biology . . . natural selection's invisible hand created the structure of the human mind, and the *interaction of these minds* is what generates the invisible hand of economics . . . .: one invisible hand created the other. (1994, p.328; emphasis mine)



The required creativity in true discovery, i.e. intuitive insights as internal surprises, cannot be explained in mechanical terms, e.g. from a machine perspective. This applies to both the technical breakthroughs in the real economy as well as the valuation of such utilities by the imagining capital markets, e.g. early “angel” investors. Moreover, and related, what sets this thesis apart is the realisation that the collective mentality of the market, like individual mentality, includes sensations. These infuse the experience of a market state in a meaningful qualitative sense and particularly impress the collective nature of that state, e.g. ‘the market’s mood may not equate to my personal mood but I am sensing it nevertheless when I have skin in the game’. In other words, intersubjectivity is an irreducible property of the market’s mind. Combined with shared unconscious drivers that are particularly attuned to collective settings, this makes the market’s mind more complex than the individual minds that compose it.

Still, this should not prevent us from improving our understanding of the market’s mind. In other words, its ontological intersubjective domain can still be explored from an individual perspective to find an epistemological explanation. The problem, however, is that our capacity to appreciate the ineffable properties, which determine the market state in a qualitative sense, does not respond to traditional market research methods, i.e. investment analysis. Instead, it relies on those mental modules, like intuition, that are considered part of System 1. Not only is System 1 ignored, if not demonised, by modern finance but there are also currently no approaches to systematically train and use these capabilities in order to achieve such understanding. Consequently, I am in the process to develop exactly such an approach, including software. As aforementioned, chapter 10 will discuss this empirical argument in more detail.

## 6.5 THE MARKET'S BODY

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Although the focus of this chapter is on the market's mind, and at the risk that it may raise more questions than it answers, I would nevertheless like to address the matter of the market's body briefly in this section. Earlier I mentioned the physical properties of a market state. The embodiment of the market, within the larger environment of the real economy, also includes the electronic equipment, varying from computers to telephones, which form the networks of information and communication that facilitate trade in today's markets. And last, but not least, it consists of the human bodies which physically handle activities involved in trading, including pushing keys on a keyboard, signing contracts, etc. Combining mind and body, it is not a stretch to suggest that the market can be perceived like an animated entity. Many market participants have expressed this in various ways (e.g. see earlier quote in 6.4). Knorr Cetina concludes that markets are "epistemic things" (Knorr Cetina and Brueger, 2000, p.3) build around flow architecture with computer screens as the centrepieces:

the terminals deliver much more than just windows to physically distant counterparties. In fact, they deliver the reality of financial markets—the referential whole to which "being in the market" refers, the ground on which (participants) step as they make their moves, the world which they literally share through their shared technologies and systems. . . . (They) visually "collect" and present the market to all participants . . . the screen is a building site on which a whole economic and epistemological world is erected. It is not simply a "medium" for the transmission of pre-reflexive interactions. (Knorr Cetina, 2003, pp.11, 13)

Those screens display, first and foremost, prices. Prices form the psychophysical building blocks of the bridge between the physical and mental domains of the market, which ultimately extends into the real economy. As numerical symbols they are discovered. Price discovery is the market's self-organising principle enacted via trading. Open, transparent and undistorted price discovery is crucial to achieve the market's version of "healthy homeodynamics" (Rose, 1998, p.17).<sup>135</sup>

The following framework to think about this is derived from Capra (1996)<sup>136</sup>. It lists key criteria for any complex "living" system and has been adjusted by me to specifically apply to the markets.

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<sup>135</sup> See also Damasio (2000).

<sup>136</sup> In turn, Capra was particularly inspired by Bateson, Maturana, Prigogine, and Varela.

<p>1. <b>Purpose</b> of existence: the principles which lead to the market's homeodynamics.</p>	<p>Survival under conditions of scarcity, leading to uncertainty.<sup>137</sup></p> <ul style="list-style-type: none"> <li>• Allocation of scarce physical resources (quantitative): survival and growth via evaluation and exchange of assets, etc. Transfers are facilitated monetarily. Uncertainty is quantified, i.e. expressed mechanically thereby aligning it with explicate, analytical knowledge, e.g. numerical models.</li> <li>• Allocation of scarce mental resources (qualitative): survival and growth via evaluation and exchange of emotions, etc. Transfers are facilitated neuronal.<sup>138</sup> Uncertainty is qualified, i.e. expressed symbolically thereby aligning it with implicate, experiential knowledge, e.g. numerical archetypes.</li> </ul> <p>Principles of portfolio management can be applied to both (see chapter 9). Prices form the numerical space of discovery bridging these domains, where meaning in the market's mind transcends individual consciousness.</p>
<p>2. <b>Pattern</b> of organisation: the configuration of relationships that determines the market's essential characteristics.</p>	<p>Organisational closure achieved through communications.</p> <ul style="list-style-type: none"> <li>• Interpersonal or collective communication is embodied in post-social relationships (Knorr Cetina and Brueger, 2000). Communication takes place via the exchange of external information (e.g. analyst reports, government statistics, contracts), or the exchange of internal information via the security exchanges (e.g. quotes, volume, order flow).</li> <li>• Intra- or transpersonal communication is embodied in the relationship with one's Self and with the market.<sup>139</sup> Communication takes place via analysis (quantitative research) and intuition (qualitative research<sup>140</sup>).</li> </ul>

<sup>137</sup> Early economic reflections (e.g. Price, 1997) often boil down to the realisation that man, left with scarce physical and mental resources (e.g. commodities and knowledge), has, in contrast, to 'deal with' the abundant physical worldly challenges, respectively the omniscience of God(s). In the Jewish/Christian traditions, this is viewed as a consequence of the original sin (see, for example, Maimonides' Guide to the Perplexed, written in the 12th century.) This 'dealing' is infused with uncertainty. Ironically, modern macroeconomics seems to suggest the existence of an omniscient and benevolent central planner to achieve the equilibrium it assumes.

<sup>138</sup> See, for example, Kuhnen and Knutson (2005).

<sup>139</sup> See, for example, Steenbarger (2003).

<sup>140</sup> see, for example, Cymbalista (2002-ii).

	Pattern emerges, among others, from (often simple) rules which frame the relationships. <sup>141</sup>
3. <b>Structure:</b> the physical embodiment of the market's pattern of organisation.	<p>Cohesion through a shared platform.</p> <ul style="list-style-type: none"> <li>• The real economy of networks to produce and exchange physical goods which include, for example, transport links. Tools to build, expand, and maintain the networks include buildings, trucks and pipes.</li> <li>• The market place of flow architecture to produce and exchange securities which include, for example, exchanges and trading floors. Tools to build, expand, and maintain the structure include telecommunication equipment, computers, and their screens.</li> <li>• The collective of human bodies, i.e. buyers and sellers, to compete and cooperate. Tools to build, expand, and maintain this collective include shared bodily and neuronal adaptations, for example mirror neurons<sup>142</sup> and number sense.</li> </ul>
4. <b>Process:</b> the activity involved in the continual embodiment of the market's pattern of organisation.	<p>Price discovery (mental activity) and trading (physical activity).</p> <p>The market's 'life' process consists of price discovery and trading, a reflexive process that organises the market and gives rise to its cognition. In Jungian terms, it is a ritual through which the collective investor community interprets and interacts with the symbols of the market (i.e. prices), thereby reinforcing its values.</p>

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<sup>141</sup> See, for example, Hayek (1967) and Kelso (1995).

<sup>142</sup> As aforementioned, mirror neurons (e.g. Gallese et al., 2007) provide a promising explanation for the neuronal dynamics involved particularly in financial contagion and herding.

These criteria are interdependent. Moreover the dividing lines between the physical and the mental within each criterion are blurry. For example, structure is not only physical but:

- in terms of boundary, it is also of a social symbolic nature: trust, beliefs, expectations, confidentiality, and so on;
- in terms of order, it is also of a psychological symbolic nature: stories (e.g. investment themes), events, personalities (e.g. gurus), etc.

This little detour on the market's body should not distract the reader from my main point: unless one denies the existence of individual consciousness the inescapable conclusion is that capital markets form a collective consciousness. Its intersubjectivity contributes to the market's (self-organising) dynamics.

Consequently, the market as a mind-body provides the proper premise for any emerging new finance paradigm. It acknowledges the existential questions that need to be addressed and helps to diagnose more clearly the psychological disorder of modern finance which is the next topic.

## 6.6 THE HARD PROBLEM FOR FINANCE

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At the peak of the financial crisis modern finance was confronted with previously unimaginable conundrums and events, among which are the 'sighting' of various non-white swans. Clearly, these events were not impossible, just not imaginable. But what is causing this lack of imagination, i.e. what is modern finance's blind spot?

Broadly speaking, and following my previous arguments, modern finance ignores the unconscious origin and phenomenal apex of consciousness in the market. The consequence is a complex due to its denial of what I call the *market's* mind-body problem. Although originated by Descartes, William James was one of the first to define the mind-body problem in general terms:

That brains should give rise to a knowing consciousness at all, this is the one mystery which returns, no matter of what sort the consciousness and of what sort the knowledge may be. Sensations, aware of mere qualities, involve the mystery as much as thoughts, aware of complex systems, involve it. (1890, p. 647)

It consists of two sub-problems: mental causation and the nature of consciousness.

Both need to be understood with the issue of 'other minds' in mind.

Specifically, the market's mind-body problem, which (following Chalmers, 1995) is the hard problem for finance, can be highlighted in two ways. First, it concerns answering the following question:

**Why do the quantities involved in physical processes give rise to the qualities of the market, i.e. mood, that complete its state?**

In other words, the physical and cognitive processes in the market are accompanied by an experience (e.g. exuberance/despair) which, combined, form its state. So, why does an understanding of a market state require the inclusion of the experience to which the physical and cognitive processes of that state give rise? Somehow leaving this experience out, by focusing exclusively on explaining the processes, does not sufficiently convey the market state. Intellectually analysing and describing these processes does not extend to knowing market states, in particular when the market 'goes mental' and you have 'skin in the game'. Moreover, what does it mean if physically equal market conditions (e.g. the S&P500 at 666), while implying the

same (cognitive) expectation, differ by way of the accompanying experiences? Any answer to this question needs to explain, among others, what the relationship is between the shared unconscious, cognitive, and phenomenal properties of the market, ultimately reflected in prices. On that note, and second, the hard problem concerns the following explanatory gap:

**The inability to explain the growing convergence of individual investor mentality into a shared uniform experience, an emotionally charged single-mindedness, which occurs during booms (e.g. euphoria) and busts (e.g. despair) and ultimately leads to their reversals.**

Modern finance does not acknowledge this problem, let alone deal with it. Neither does behavioural finance, which suffers from the same issue as the broader cognitive science of which it is part (see 4.1 for earlier quote from Kim).

Applied to finance, prices are not only the mediators but the actual conductors of the shared 'felt qualities' of market states, i.e. investors experience the market primarily via prices. However, the dominant theories consider the experience of prices as not integral to an understanding of the phenomenon of a market state. Specifically, modern finance explains the market in terms of computational mechanisms employing analytical research methods. To some extent this is natural, as markets involve a whirr of information processing. As aforementioned, it can explain processes like production, supply, leverage, discounting, etc. But these explanations are in terms of functional correlates to prices assuming the steady mental state of rationality. Existing attempts to capture sentiment or mood are lacking because they are based on a mechanical interpretation of the phenomena involved, which limits their knowledge content. For example, analytical indicators like put/call ratio, bull-bear spread and the 'fear gauge' VIX supposedly represent sentiment, but these fail



to convey its characteristic quality of internality, namely the sensation of what it 'feels like'.

In both cases simplified methods aimed at functional explanations are applied to deal with finance's problems. However, imagine a crowd listening to a concert, or a crowd watching their burning apartment block, or another crowd attending a funeral. Just like a functional explanation of the sound of a piano, the yellowness of fire, respectively the hurt of death does not do justice to their *appreciation in those settings*, neither does a functional explanation of the price dynamics that culminate in the S&P500 at 666. As aforementioned, a technical term for this appreciation is quale (multiple: qualia), e.g. the quale of yellow.<sup>143</sup> Price qualia refer to the phenomenal aspects of the market's mind which prices transmit. Through prices investors collectively experience the raw feels of market states.<sup>144</sup> Specifically, over and above reflecting information about the market's physical and cognitive processes, prices impress the distinctive intersubjective character of the market's mental states, generally identified as moods. The following description by neuroscientist Dehaene of the phenomenal experience of numbers could have been written about committed investors in their relationship to prices whereby the market is:

a landscape of numbers . . . within which (they) can move freely. These people claim to experience numbers in a phenomenal way, often within a spatial setting, and they claim that numbers and their properties immediately pop to mind. Furthermore, many claim to experience strong pleasure associated with this - some go as far as to prefer the company of numbers to that of other fellow humans! (1997-ii, p.14)

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<sup>143</sup> There is extensive literature available on qualia as the qualitative characters of conscious experience (e.g. Nagel, 1974; Levine, 1983; Chalmers, 1996). As aforementioned, research by Burr and Ross (2008) extends the concept of qualia to numbers. The majority of philosophers and other mind researchers accept their existence but critics include, for example, Dennett (1988).

<sup>144</sup> While Soros' famous back pains are an example of bodily sensations at the individual level (see, for example, Cymbalista, 2002-ii).

The quality of the experience of price dynamics includes its duration (called intrinsic time, e.g. Derman (2002); Olsen (2004)) as well as its uniformity (e.g. the 'shared comfort' of the crowd). Price qualia overlay investors' cognitive participation in the market and complete the latter's state. Their inclusion is crucial in order to answer questions that, according to Bechara and Damasio, existing (behavioural) theories have failed to address:

why do states of optimism lead to different choices than states of pessimism? Why when the market is crashing everyone rushes to sell, and when it is growing, everyone rushes to buy? (2005, p. 362)

To paraphrase James, it is the "radical empirical" shared participation of investors in the market that makes the market's mind reflexive. This experience has been vividly worded in the literature by numerous traders and investors (e.g. see earlier quote in 5.4). 'Being in the market's mind but not of it' seems to capture the struggle of the contrarian within the crowd (e.g. Martin, 2005) in that respect.

Market consciousness, as a composite of individual investor consciousness, originates in the collective unconscious and culminates in phenomenal consciousness. Whereas the former involves the survival instincts for dealing with the unknown, the latter involves qualia which convey the intimacy of experiencing. Even at the individual level neither instincts nor qualia are reducible to psycho-neural or functional mechanisms. In markets these dynamics play out intersubjectively which only adds to their cognitive elusiveness. Still, they are involved in understanding the state of the market beyond analysis and logic. Any exclusion of phenomenal consciousness, for example, results in a form of phenomenal absence (Sartre, 2004, p. 180). This leads to a lack of knowledge comparable to that suggested by former Chancellor of the Exchequer Geoffrey Howe when he criticised an economist as being "a man who knows 364 ways of making love, but doesn't know any women" (Flanders, 2006).

The physics complex extends beyond finance theory into investing itself. Specifically, current practice seems to promote the repression of evolved psychological adaptations because the emotional outputs they generate are deemed 'inappropriate' for modern economic times. Instead, highly quantitative models are applied which generate mechanical outputs, believed to capture these times in an objective fashion.<sup>145</sup> But along the way we seem to have forgotten that the investor doesn't live in a mechanical world. He lives in a symbolic world, the world of prices and the myths that surround them. Hayek realised this when, implying price, he stated that the market communicates "In abbreviated form, by a kind of symbol" (1945, p. 547). Although prices have a signalling property this 'intermittent message' does not exhaust their meaning. In the spirit of Knightian uncertainty, symbols are "the best possible expression at the moment for a fact as yet unknown" (Jung, 1921, para.817). What is involved in the discovery of these symbols, particularly in a collective setting, was profoundly expressed by physicist Wolfgang Pauli in the earlier quote in 2.3.

As numerical symbols, prices contain intuitive meaning: prices and their patterns convey a number sense of the market's state. Compared to the numbers used in the natural sciences, prices are neither innocent experimental trials nor verifiable characteristics of inanimate objects. They are produced by the collective psychology of economic survival and receive the qualitative valuation, Jung's "emotional charge", from the archetypal dynamics involved in that struggle. Accordingly, prices are Jung's "living symbols": they are born of and respond to human engagement. It is the transition from observation (building models, i.e. forecasting) to participation

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<sup>145</sup> Predatory high-frequency trading and the May 2010 Flash Crash are examples of how extreme these developments have become. In chapter 8 I use AIT to critically discuss the current mechanical approaches to markets in a Gödel-Turing framework. Overall, I have my doubts on whether artificial intelligence (e.g. representative agent models) can offer solutions to finance's hard problem. See also, for example, Penrose (1995) and Dehaene (1997-i).

(applying models, i.e. buying/selling), the execution into actions to use Mises' terms, which makes the uncertainty involved reach beyond that of physics' Heisenberg Principle.

To conclude, proper understanding of market states requires inclusion of price affects. As Damasio reminds us, "Emotions and feelings have no crystal ball to see the future. Deployed in the right context however, they become harbingers of what may be good or bad in the near or distant future" (2004, p. 147).<sup>146</sup> Consequently, it is no wonder that:

the quality of decision making suffers when affective inputs are suppressed by having decision makers think systematically about the pros and cons of a decision. (Loewenstein et al., 2001, p. 268)

## 6.7 CONCLUSION

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How did it feel when Lehman collapsed? In markets, efficiency may be at the heart of the matter but experience is at the heart of the mind. To better understand the market's mind one has to reflect on its qualitative affects, the shared sensations of its shifting states. The current dominant finance paradigm does not face up to this issue and thus sustains the market's mind-body problem. Or, in the words of Soros (1994), "Applied to events which have thinking participants, it provides a distorted picture of reality." As this extends to practical applications and processes which

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<sup>146</sup> On the role of emotions in trading see, for example, Fenton-O'Creevy et al. (2011).

impact the market and beyond, this hard problem has become a worrying complex.<sup>147</sup>

From the outset I stated that this chapter would be about highlighting this problem rather than about solving it. Still, having done so by raising the question above, finance can now start dealing with it. The mind sciences can guide us in our search while gaining insights from our rich source of 'mind-matter' data:

The general problem of the relation between psyche and physis, between inside and outside, can hardly be regarded as solved . . . Yet, perhaps, modern science has brought us closer to a more satisfying conception of this relationship, as it has established the notion of complementarity . . . It would be most satisfactory if physis and psyche could be conceived as complementary aspects of the same reality. (Pauli, 1952, p. 164)<sup>148</sup>

Finally, I expect any new paradigm that acknowledges consciousness and accepts the unconscious origin as well as phenomenal culmination of price discovery to rebalance our investment research efforts by compensating the current overreliance on mechanical finance and analytical methods.

In the next chapter I will discuss in more detail mass psychology and herd instinct in the context of my hypothesis, with a special focus on the link between participation mystique and mirror neurons.

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<sup>147</sup> In light of the delicate symbolic nature of price discovery we can rightfully ask, for example, "When does manipulating the market's mind lead to harmful damage?" Stretching the mind-body perspective, other issues I have not raised here include, for example, the market's awareness of the impact of its behavior in terms of ethics, sustainability, etc. On inequality, for example, see my article here: <http://www.financialsense.com/contributors/patrick-schotanus/economic-equality-conscience>.

<sup>148</sup> I use the translation by Atmanspacher and Primas (2006).

## CHAPTER 7. HERD INSTINCT: PARTICIPATION MYSTIQUE AND MIRROR NEURONS

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*This is the . . . Collective. Prepare to be assimilated. We will add your biological and technological distinctives to our own. You will adapt to service us. Resistance is futile.*

*Star Trek, The Next Generation, Episode "Q, Who?"*

### 7.1 INTRODUCTION

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In this chapter I will discuss the implications of my hypothesis for the phenomena of crowds and herding. I thereby make the following distinctions:

- 1) Between crowd psychology and contrarian psychology. Specifically at the unconscious level, I will argue that Jung's participation mystique promotes herding behaviour whereas its counterforce, individuation, promotes contrarian behaviour.
- 2) Between unconscious participation mystique and conscious participation confabulation. Whereas the former instigates an unconscious induction among the crowd, the latter rationalises, i.e. justifies, participation in it.

Mirror neurons play an important neurobiological role in this respect. Whereas in section 3 below I describe the link between mirror neurons and participation mystique, in section 4 the latter is discussed in the context of markets. However,

first I will explain my use of the terms crowd and herding in the context of this thesis.

## 7.2 CROWDS AND HERDING

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The term crowd is used to describe a dominant group of investors who collectively are buying into or are selling out of a theme, which is physically captured in a security and symbolically in a numerical price, accompanied by a narrative (i.e. myth). We recognise crowd behaviour, for example, in terms of 'a crowded trade' where a large number of investors initially pile into an asset, to only subsequently abandon it en masse. A crowd, therefore, is not equal to the collective investor community, i.e. the market, but rather represents a (large) subsection. I will focus on the psychological aspects of crowds, in particular their emerging composite profile. In that respect I use the term crowd as intended by, for example, Le Bon whose view echoes the spirit of emergence of complexity:

an agglomeration of men presents *new characteristics very different from those of the individuals composing it*. The sentiments and ideas of all the persons in the gathering take one and the same direction, and their conscious personality vanishes. *A collective mind* is formed, doubtless transitory, but presenting *very clearly defined characteristics*. The gathering has thus become . . . a psychological crowd. It forms *a single being*, and is subjected to the law of the *mental unity* of crowds. (2006, p. 23; emphasis mine)

Le Bon's "law" can be interpreted in Jungian terms. Central is the collective unconscious which influence, via commonly shared or archetypal characteristics, individual minds and leads to their convergence. In Le Bon's words, these unconscious "forces" overwhelm the individual conscious personalities in a crowd:

Our conscious acts are the outcome of an unconscious substratum created in the mind in the main by hereditary influences. This substratum consists of the innumerable common characteristics handed down from generation to generation . . . It is precisely these general qualities of character, governed by forces of which we are unconscious, . . . that in crowds become common property . . . The heterogeneous is swamped by the homogeneous, and the unconscious qualities obtain the upper hand. (Ibid, pp. 32-33)

In line with the overall negative bias of Le Bon, as well as Jung, towards crowds, I argue that crowds in markets, reflected in crowded trades, can become a threat to the survival of the overall investor community, i.e. the markets themselves. Prices can act as the Pied Piper, mesmerising crowds to march to the same music back into the caves. This is particularly the case where price discovery is hampered by artificial interference, lack of transparency, etc. The reason is that these prevent the market's natural self-correcting mechanisms from operating. Earlier we read that artificial interference in markets (e.g. subsidies, quantitative easing, manipulation, intervention, etc.) distorts price discovery. Specifically, financial repression involves primarily the promotion of 'politically correct' prices at the costs of repressing 'psychologically correct' ones, if only because the latter are deemed as 'too painful' for the constituency.<sup>149</sup> From a Jungian perspective we can view a crowd which sustains a 'financial repression' trade as being engaged in "Shadow" price projection rather than "Self" price discovery: "Political agitation in all countries is full of such projections" (Jung, 1964, p. 181).

In turn, such price projection can lead to herding. Herding is the convergence of individual behaviours into a common behaviour, specifically applied to buying and selling. In extreme cases, herding reflects group neurosis, a central characteristic of

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<sup>149</sup> For a good summary see Reinhart et al. (2011).



which is an over-reliance on the quantitative meaning of prices.<sup>150</sup> In such a state the qualitative assessment of uncertainty in price discovery is ignored under the belief of quantifiable risk, i.e. prices are considered to be signals derived from a known or estimable distribution instead of symbols emerging from the unknown. Clearly, and worryingly, herding can threaten the species as a whole if natural corrective forces are inhibited. It is in this context that we should see systemic risk: in the extreme, crowded trades threaten the financial system, particularly if the market is not allowed to 'unwind them' via its natural correcting mechanisms, i.e. the conscious and unconscious forces which, often violently, counterbalance and achieve homeostasis for the market's mind.<sup>151</sup>

In the next sections I will explain this in more detail, beginning with participation mystique.

### 7.3 PARTICIPATION MYSTIQUE AND MNS

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The unconscious, by way of the archetypes, enables the mind to symbolically deal with the uncertainty of the unknown, i.e. to imagine. For our purposes, and in extremis, imagination runs along a scale, from insights to obsessions, which correlates with the number of people involved in the exercise. Imagination starts with insights among one or a small number of individuals. These 'contrarians' think

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<sup>150</sup> To refresh, the quantitative meaning of prices involves their cognitive properties which are quantifiable, i.e. via (objective) functions, based on the premise of the market as a physical mechanical system. The qualitative meaning of prices, on the other hand, involves their phenomenal properties which can only be experienced as qualia based on the premise of the market as a mental conscious system. Their archetypal meaning, via numerical archetypes, bridges the two. An archetypal experience consists of an ouroboros "strange loop": it originates in the unconscious (tail), is realised in cognition (body), and culminates (as in 'is consumed'), in the phenomenal domain (head).

<sup>151</sup> See, for example, Stevens (1990, p. 47) for a detailed discussion on psyche and homeostasis.

out-of-the-box in the sense that they perceive things the majority do not (yet) perceive. It is in the unconscious where such novelty and innovations endogenously originate for the mind, a necessary requirement for any complex adaptive system to be creative and flourish. Insightful 'surprises', aka Eureka moments, occur most frequently in contrarian thinkers whose intuitive attunement to the meaning of symbols provides an early warning system of their 'writing on the wall'. From there it can resonate to the critical minority, like a shared 'Aha Erlebnis'. However, these can transform, via participation mystique, into obsessions:

The louse in symbolism usually carries the meaning of a completely autonomous thought; something that sticks in your mind, though you don't want it, and sucks your blood. It is a beautiful symbol for thought obsession: an idea that stays in your mind, obsesses all your other thoughts, and at the same time sucks your blood, takes away your psychic energy. (Von Franz, 1995, p.44)

I believe the neuronal basis for this process is mirror neurons. Mirror neurons were discovered about two decades ago by neuroscientists at the University of Parma (Italy)<sup>152</sup>. Much research has since been done to uncover their purposes (Ramachandran, 2006; Rizzolatti et al., 2007, Mukamel et al., 2010).<sup>153</sup> The term mirror neuron system (MNS) is used to refer to the cortical network they form. In this section I will highlight the properties of mirror neurons via Gallese et al. (2007), primarily because they discuss the MNS in the context of psychoanalysis and focus on "the experiential aspects of intersubjectivity" (footnote 1).

First, they provide a brief summary of mirror neurons:

The neural circuits activated in a person carrying out actions, expressing emotions, and experiencing sensations are activated also, automatically via a mirror neuron system, in the observer of those actions, emotions, and sensations. . . . this finding of shared

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<sup>152</sup> Including Vittorio Gallese who I've met on a few occasions and have corresponded with. Apart from herding, we particularly discussed the potential role of mirror neurons in momentum.

<sup>153</sup> Although some controversy remains, e.g. Heyes (2009); Churchland (2011).

activation suggests a functional mechanism of 'embodied simulation' that consists of the *automatic, unconscious, and noninferential simulation in the observer of actions, emotions, and sensations carried out and experienced by the observed*. (Ibid, p.131, emphasis mine)

Embodied simulation is different from standard interpretations of simulation, like the theory-theory account. Those perspectives suggest that the observer explicitly and cognitively simulates the other's emotional state. The observer makes a conscious effort by pretending to feel the same as the other via generating similar actions, emotions, and sensations. Instead of relying on such introspection, embodied simulation is:

a mandatory, nonconscious, and prereflexive mechanism that is not the result of a deliberate and conscious cognitive effort aimed at interpreting the intentions hidden in overt behavior of others (Ibid, p. 143; emphasis mine)

Next, the authors echo the description by Jung of participation mystique:

The other's emotion is constituted, experienced, and therefore *directly understood by means of an embodied simulation producing a shared body state*. It is the activation of a neural mechanism [MNS] *shared by the observer and the observed* that enables *experiential understanding . . .* Based on the mirror neuron phenomenon and related findings, one can say that in virtually any interpersonal interaction there is an automatic *unconscious "induction" in each participant* of what the other is feeling. (Ibid, p. 144, 149; emphasis mine)

Recognise the resemblance between their expression of an "unconscious" "shared body state" and the following description by Jung:

The mass is swayed by a participation mystique, which is nothing other than *an unconscious identity*. Supposing, for example, you go to the theatre: glance meets glance, everybody observes everybody else, so that all those who are present are caught up in *an invisible web of mutual unconscious relationship*. (CW11, para. 226; emphasis mine)

Importantly, the unconscious recognition and subsequent replication of these patterns may include their symbolic manifestations, like linguistic expressions and numbers:

the same neural structures are activated both during the subjective experience of pain and in the direct observation *or symbolically mediated* knowledge of someone else's experience of the same painful sensation. (Ibid, p. 142; emphasis mine)

Embodied simulation is a central element in the process of pattern recognition and enables the mind to model its interactions with the environment, in particular those with other minds. It generates a specific phenomenal state of "intentional attunement" leading to "a peculiar quality of familiarity with other individuals" (Ibid, p. 144). Specifically, mirror neurons play a role in intention understanding and action prediction:

action prediction and the ascription of intentions are related phenomena, underpinned by the same functional mechanism, embodied simulation. In contrast with what mainstream cognitive science would maintain, action prediction and the ascription of intentions—at least of simple intentions—do not appear to belong to different cognitive realms; rather, both pertain to embodied simulation mechanisms underpinned by the activation of chains of logically related mirror neurons. (Ibid, p.137)

Participation mystique has the biggest potential impact if there is:

- a simultaneous observation by multiple participants,
- of a shared symbol of attention (or desire)<sup>154</sup>
- which captures human (e.g. their own) behaviour.

Let's take a closer look at how this is manifested in markets.

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<sup>154</sup> In another paper, Gallese (2009) links the MNS to Girard's Mimetic Theory and mimicry. Specifically, he highlights the object of shared attention, or the "Third" in Jungian terms: "The intrinsic value of the objects of our desire is not as relevant as the fact that the very same objects are the targets of others' desire."

## 7.4 PARTICIPATION MYSTIQUE IN MARKETS

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In capital markets the shared symbol of attention consists of the price, whereas the shared object of attention is the security.<sup>155</sup> Via participation mystique multiple minds interact at the unconscious level to form a “web of mutual unconscious relationship” to the point of “a shared body state”. Jung adds that because this is such an easy and convenient way of raising one’s personality to an exalted rank, masses are always a breeding ground of psychic epidemics (CW11, para. 226-227).

Bubbles and hypes in financial markets qualify for such epidemics. They reflect the culmination, and subsequent collapse, of a particular Zeitgeist in the economic domain<sup>156</sup> or, alternatively worded, the economic dimension of a societal Zeitgeist. The internet bubble is an obvious example, when technological progress seemed unbounded. As far as the spreading of uniform behaviour is concerned, Sornette and colleagues, unwittingly, expanded upon Jung’s example of a theatre crowd in a paper on the bubble in Chinese equities:

the audience expresses its appreciation with applause. In the beginning, everybody is handclapping according to their own rhythm. The sound is like random noise. There is no imminence of collective behavior. This can be compared to financial markets operating in a steady-state where prices follow a random walk. All of a sudden something curious happens. All randomness disappears; the audience organizes itself in a synchronized regular beat, each pair of hands is clapping in unison. There is no master of ceremony at play. This collective behaviour emanates *endogenously*. It is a pattern *arising from the underlying interactions*. This can be compared to a crash. There is a steady build-up of tension in the system (like with an earthquake or a sand pile) and without any

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<sup>155</sup> See also Schotanus, 2013.

<sup>156</sup> For examples of books that attempt to capture the current Zeitgeist, see <http://blogs.lse.ac.uk/businessreview/2016/01/02/four-books-that-will-get-you-up-to-speed-with-the-current-economic-zeitgeist/>

exogenous trigger a massive failure of the system occurs. There is no need for big news events for a crash to happen. (Bastiaensen et al., 2009; emphasis mine)

Kelso provides the neuroscientific proof that such convergence in clapping is involuntarily:

From these experiments, a rather profound message emerged . . . With a colleague in one booth and me in another, sight unseen but not sound unheard, I tapped out a rhythm with my hand. The colleague's task was to syncopate with me. "Try to produce a beat in between my taps," I requested. As in the hand movement experiments, I gradually increased the tapping rate . . . At a certain critical rate my colleague spontaneously starts to synchronize with me. *He can't help himself.* (1995, p. 93; emphasis mine)

Like Jung, Von Franz saw participation mystique as a psychological condition in which various inanimate objects and people interact and are connected with each other beneath the surface of consciousness. In this condition, there is no differentiation between the subject and the crowd because each individual identifies with the object which symbolises the theme the crowd stands for. This object represents the crowd identity: it becomes the shared object of experience through which each individual identifies with the crowd. Jung points to a regression of the individual mind to a primordial unconscious state:

I use the term identity to denote a psychological conformity. It is always an unconscious phenomenon. . . . It is a characteristic of the primitive mentality and the real foundation of participation mystique, which is nothing but a relic of the original non-differentiation of subject and object, and hence of the primordial unconscious state. (CW 6, para. 741)

The identity with an object which symbolises a (magic) theme is a characteristic aspect of participation mystique. It originates with Jung's distinction between "fantastic thinking" and "directed thinking".<sup>157</sup>

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<sup>157</sup> As an aside, this inspired Freud to write his paper "Formulations on the Principles of Mental Functioning", according to Adams (2004, p. 2).

In general investment terms an asset, or rather its security, is that object of shared attention. Examples of popular securities during hypes include the Nasdaq-100 index (ticker: QQQ aka “cubes”) at the time of the internet bubble, Markit’s ABS/MBS<sup>158</sup> indices (tickers: ABX/CMBX) during the US housing bubble, and gold (ticker: GC or its ETF GLD) during its recent bubble. A security’s theme is the story which captures the symbolic narrative (i.e. the myth) and, initially, unites the crowd. The security’s price is the ultimate, namely numerical, symbol (of success/failure) of this theme, which has an unconscious and reflexive impact. Its dynamics not only reflect the observable behaviour of the crowd but also trigger the unconscious induction which, for example, leads to the imitation so characteristic in that behaviour. Price dynamics express the emotions of the composite investor and I would argue therefore that prices fulfil Gallese’s “symbolically mediated knowledge of someone else’s experience.” Physiologically speaking, observing price movements on a screen, which is a daily ‘obsession’ of investors, trigger the mirror neurons and may explain the phenomenon of momentum.

The mutual influence of crowds and the individual scale from the destructive to the creative. In terms of the latter, participation mystique is the perception of the individual investor to be part of a larger whole to which he contributes, and becomes co-creator. Trader Tom Belsanti expressed it as follows:

All the markets I’ve been involved in—Eurodollars, bonds, currencies—are markets that are watched throughout the world. After making a trade . . . and it’s the high or low of the day, and reading the newspaper the next day, I like to say to myself, “Oh, that eight trade, that was me! I sold those or I bought those.” For me that is a tremendous high. The *mystique* of knowing the whole world is watching what we’re doing and just *to be part of it*. (Koppel, 1996, p. 173; emphasis mine)

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<sup>158</sup> Asset-Backed-Securities, respectively Mortgage-Backed-Securities.

This is particularly the case in uncertain situations where individuation is at an early stage, and the encounter is with abstract, unknown objects. The process of individuation, instigating contrarian psychology, is difficult (see also chapter 10). The individual has to discover values other than the collective to enrich, i.e. pay back, the collective. Jung talks about individuation cutting one off from personal conformity and hence from collectivity. And about guilt, the need to redeem and offer a ransom. Crucially:

Whoever is not creative enough must re-establish collective conformity with a group of his own choice, otherwise he remains an empty waster and a windbag. Whoever creates *unacknowledged values* belongs to the condemned, and he has himself to blame for this, because society has a right to expect *realisable values*. For the existing society is always of absolute importance as the point of transition through which all world development passes, and demands the highest collaborative achievement from every individual. (Jung, CW18, para.1095-1098; emphasis mine)

Again, this is very applicable to markets where the abstract object is a security and the relationship is entered by way of a trade for a price, which results in a sense of ownership. Balsanti's 'time stamp of his price' can be viewed in the Jungian terms of "mineness" the affinity of which with personality is, according to Jung, aptly characterised by participation mystique. It is an irrational, unconscious identity, arising from the fact that anything a person comes into contact with is not only itself, but also a symbol. This symbolisation comes about firstly because every human being has unconscious contents, and secondly because every object has an unknown side. "Where two unknowns come together, it is impossible to distinguish between them. The unknown in man and the unknown in the thing fall together in one. Thus there arises an unconscious identity" (Jung, CW11, para. 389).

Jung always warned about the risk of mass neurosis, for example in situations where the archetypal nature of symbols are lost in the rituals surrounding them, in



particular the confabulations to rationalise and sustain the theme, ironically often against all reason. We can interpret this as the influence of the crowd in terms of assimilation thereby separating the individual from the market, the true centre of price discovery:

The inevitable psychological regression within the group is partially counteracted by ritual . . . But if there is no relation to a centre which expresses the unconscious through its symbolism, the mass psyche inevitably becomes the hypnotic focus of fascination, drawing everyone under its spell. (Jung, CW9i, para.227)

The ego of the individual requires a healthy balance in order to avoid either a godlike ascent above everybody else (i.e. super-ego) or, at the other extreme, an annihilation into crowd-consciousness. Each crowd has its leaders, spoke persons to defend the 'cause'. They often create the aforementioned confabulations which distort the true meaning, in the sense of its symbolism, of the theme. As Jung points out, leaders want decision in favour of one thing, and therefore the utter identification of the individual with a necessarily one-sided 'truth'. "Even if it were a question of some great truth, identification with it would still be a catastrophe, as it arrests all further development." (CW 8, para. 425).

Nowhere is this more applicable than in financial markets where symptoms overwhelm the cause, gurus become all-knowing, and 'maps are confused with the territory'. Ultimately, people basically lose sight of the symbolic nature of numbers:

- a chart pattern is not a true reflection of price dynamics;
- a risk model is not a true reflection of dealing with uncertainty;
- a backtest is not a true reflection of trading;
- a price is not a true reflection of value.

### Investment note: housing bubble<sup>159</sup>

How destructive can participation mystique be? Scarily destructive, as the crisis has shown. The urge to participate in the American dream of owning a home turned into an awful nightmare, with devastating consequences worldwide. The idea of the 'ownership society' was initially advanced by president Clinton and subsequently followed up with targeted policy initiatives by president Bush (expressed as late as 2005 in his inaugural address at the apex of the housing boom.)

Clearly, participation involved more than buying into the symbol of 'the home', and extended beyond home owners. It involved a worldwide credit binge facilitated by interest rate manipulations, subsidies, securitisation and shadow banking, all of which distort price discovery. Its hangover has affected investors and non-investors alike, from Icelandic banks to UK mom-and-pop stores. Alan Greenspan characterised it as a once-in-a-century crisis, and most experts agree that the global financial system had teetered on the edge of the abyss. Various artificial measures, mostly politically motivated like subsidies and (implicit) guarantees, distorted the delicate process of price discovery due to the emphasis on the quantitative dimension of the price: 'View a home as a (sure) thing, i.e. an investment object'. They caused natural deep-seated emotions regarding uncertainty (i.e. fear) to be repressed (e.g. losing a roof over one's head/collateral) or vice versa allowed their counter-balancing emotions (i.e. greed) to overflow (e.g. making a buck/gaining excess yield by 'flipping' an apartment). Psychologically, home ownership became house possession in the sense that the search for home values got swamped by the chase for house prices. Technically home ownership became property securitisation where underlying mortgages were sliced and diced. We can interpret this in Archetypal Valuation<sup>160</sup> terms: the price of a home no longer properly reflected the qualitative dimension of ownership, in the sense of conveying its qualia.

The common psychological denominator to this mania, as always, is the loss of individual identity, as one's consciousness is submerged into a mass movement: "A group experience takes place on a lower level of consciousness than the experience of an individual." (Jung, CW9i, para. 225) And with it goes individual responsibility out of the window, exemplified by dumping one's house keys in the mail box when defaulting on the mortgage.

## 7.5 CONCLUSION

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<sup>159</sup> See *The Big Short* (Lewis, 2011), as well as the movie of the same title.

<sup>160</sup> See Chapter 9.

To conclude, participation mystique adds to other suggested drivers of group behaviour. They, however, with a few exceptions, do not explain the unconscious nature of herd instinct, nor the neuronal processes underlying it. The common neural substrate of the MNS, which leads to an “unconscious induction”, is the neurophysiological dimension of participation mystique. The insights into the innateness of numbers provide neuroscientific support for the primacy of numerical archetypes within the mind’s unconscious processes. Combined into the AMH they offer a powerful explanation for herd instinct involved in emotionally charged numbers, i.e. prices.

As the numerical objects of shared attention, prices take centre stage in markets. They and their discovery are the topic of the next chapter.

## CHAPTER 8. PRICES AND THEIR DISCOVERY

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*We're trading mob psychology. We're not trading corn, soybeans, or S&P's. We're trading numbers.*

*Tom Willis  
Original Turtle, protégé Richard Dennis*

*I've already got the prize. The prize is the pleasure of finding the thing out, the kick in the discovery.*

*Richard Feynman*

### 8.1 INTRODUCTION

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This chapter deals in more detail with the symbolic nature of prices, among others by contrasting it with the mechanical nature assumed by the Rational Expectations Hypothesis (REH) which is central, for example, in EMH. First, I will discuss AMH's perspective on rationality and highlight the origins of various 'counting' terms. In the second section I will provide arguments from Algorithmic Information Theory (AIT) on the limitations, in particular incompleteness, of EMH. This follows similar critiques on rational expectations, all from a complexity, i.e. Gödel-Turing, perspective (e.g. Arthur, 2005; Spear, 1989). The third section emphasises the duality in price. It 'sets the stage' for applying Jung's view on the Binarius as the elementary pattern in price moves.

As a reminder (of terminology), the term system in general is short for a complex adaptive system (CAS). There are many types of systems. The term financial system is, more or less, equivalent to 'the market' and refers to all the individual markets, i.e. their participants, combined. The singular system refers, in that context, to an

individual market within it unless specified differently. And environment refers to the outside world of which both form part. In another context, the unknown is the space where discovery takes place. It confronts the mind with uncertainty. For the sake of simplicity I assign the terms unconscious and cognitive to the two systems of mind, in the context of dual-system theories of mind. They form the opposing forces whose competition (and cooperation) generates the mind's discoveries. The phenomenal system provides the third system, a qualitative overlay, the culmination of Jung's "tension" between these forces (see below). In dealing with the unknown, the unconscious remains unknowable, the cognitive thinks it knows, and the phenomenal feels how it's like.

## 8.2 RATIO, CALCULATION AND COMPUTATION

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*Such a really remarkable discovery. I wanted your opinion on it. You know the formula  $m$  over naught equals infinity,  $m$  being any positive number? [ $m/0 = \infty$ ]. Well, why not reduce the equation to a simpler form by multiplying both sides by naught? In which case you have  $m$  equals infinity times naught [ $m = \infty \times 0$ ]. That is to say, a positive number is the product of zero and infinity. Doesn't that demonstrate the creation of the Universe by an infinite power out of nothing? Doesn't it?*

*Aldous Huxley, Point Counter Point (1928), Chapter XI*

The origin of rationality lies in the meaning of the word ratio. Ratio refers to the relation in degree or number between two things in terms of a shared unit of measurement which allows comparison.<sup>161</sup> This highlights the numerical expression of the relationship and harks back to the earlier comments on distinction as the

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<sup>161</sup> Latin: calculation, derived from *ratus*, past participle of *rēri*: to reckon, to count (Source: The American Heritage Dictionary of the English Language, Fourth Edition; copyright by Houghton Mifflin Company).

trigger for consciousness to emerge. In particular, allow me to repeat Jung's reflections concerning the One, and the Other (Two):

Thus there emerges a tension of opposites between the One and the Other. But every tension of opposites culminates in a release, out of which comes the "third". In the third the tension is resolved and the lost unity is restored.

Contemporary use of the word rationality implies reason and optimality in decision making. Among others, it requires a problem to be formulated in numerical terms, specifically ranking. For example, Savage's axiom states that rationality dictates that if I is preferred to II, and II is preferred (or indifferent) to III, then I is preferred to III. Whatever the properties of I, II or III, they are 'comparable in nature' so that the resulting numerical values, which make reason and optimality possible, can be ranked. In equation terms:  $I > II$ ;  $II \geq III \Rightarrow I > III$ . One example of a ratio is probability, e.g. 50/100.<sup>162</sup> Another example is an exchange rate between currencies, like the number of dollars per pound. As aforementioned every price is in fact the ratio of the units of one item over the units of the other item in an exchange.

Although rationality is dominant in most situations of decision making, it often fails when these numerical values become contaminated by intersubjectivity, instigated by archetypal dynamics involved in collectively dealing with the uncertainty of the unknown. Specifically, what Jung adds to Knight's uncertainty is the extent of uniformity in unconscious attunement within groups, driven by participation mystique, as the level of uncertainty changes. If we view the group's mind as a

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<sup>162</sup> Another example comes from trading. First, in the broader context of numerical archetypes, no single number or category of numbers can be the exclusive representation of the "archetype an sich". In fact, the ratio 0.618, also known as the golden mean, can be viewed as a clear example of a number outside of the integers with archetypal qualities. In practise, this ratio, and others based on the Fibonacci number sequence, have been applied by traders for decades, in many cases via technical analysis methods, like the Elliott Wave Principle.

complex adaptive system, we can express its healthy state as a relatively stable ratio between the internal innovations (i.e. 'insights' which are endogenously generated) and external surprises (i.e. 'news'). In general, a healthy mind can handle uncertainty in that it shows healthy growth: the numerator can keep up with the denominator and increases at the same pace, i.e. the ratio remains stable. Others can't handle surprises and get 'taken over by events'. And then there are those whose exposure to external surprises is artificially constrained. What are the consequences for these latter two unhealthy conditions where the ratio becomes so large, respectively small, that rationality is lost? More broadly, what does it mean when we end up with an "irrational" number, one that cannot be expressed as a ratio of integers? Surely it means that the perceived 'probability' of being able to deal with uncertainty (i.e. select contents "best suited to themselves") becomes skewed?

First, let's assume that the external surprises are exactly that, externalities which are beyond the system's control. Consequently, the cause for the imbalanced ratio must be within the system: its ability to (be creative and) discover is hampered. Within a market (for a security), the opposing forces are two groups, the "One" and the "Other" (e.g. bulls/bears, longs/shorts, commercials/hedgies, etc.). Each has a competing objective for a shared object of attention. The shared object of attention is a security, symbolically represented by its price accompanied by a narrative (i.e. theme.) Price moves reflect the composite behaviour<sup>163</sup> of the market, as well as its intent. For example, the shared objective is reflected in the price's (extrapolated) trajectory. In terms of the narrative, myth refers to the original story as shaped by the initial investment insights, i.e. how the theme came to be. Accompanying its

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<sup>163</sup> More specifically, the allocated attention in consciousness.

price, the myth of an investment can convey the meaning of holding it.<sup>164</sup> In fact, it is supposed to symbolically transmit the archetypal experiences of discovery which, at the time and by definition, involve instinctive emotions due to the confrontation with the unknown. However, like price, the perception and meaning of the myth can be distorted if understanding is limited to one-mindedness, i.e. overreliance on either the unconscious or the cognitive.

Let me come back to what hampers the system's discovery. It is the growing imbalance between the opposing forces within the system. In short, the two groups merge<sup>165</sup> to form a crowd with single mindedness. Whereas their healthy "ratio" leads to the productive tension underlying the search, distortion now leads to consensus and the erosion of diversity in thinking. If the healthy ratio is the number-image of the numerical archetypes in a balanced market, the distorted ratio is the number-image of the complex in a crowded market. The crowd growing confidence in how to 'manage events' leading to a misplaced sense of 'certainty' comforted by its 'safety in numbers'. Contrary to the established opinion I believe that the sequence in crowd dynamics starts with too much rationality and is followed by the eventual release of (counter-balancing) repressed emotions, initially from a few 'mad' contrarians. The crowd's single-mindedness is mechanical, initially engineered with an overemphasis of the cognitive arguments in the form of a confabulation which rationalises (continued) participation in the group, i.e. to convince even more outsiders to buy the story.<sup>166</sup> The unconscious induction (see Chapter 7) of participation mystique explains why those price movements, which are driven largely by growing crowds, receive more 'outrageous' valuations and accompanying stories:

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<sup>164</sup> Again, "holding an investment" simply means having a long or short position/trade in the security.

<sup>165</sup> This should be interpreted broadly to include "assimilation", "takeover", etc. of one group by the other.

<sup>166</sup> Somehow I also think Rubinstein's (2001) argument of "over-researching" fits into this category but I need to think more on this.



only more extreme (Jung would say 'God-like') versions of the theme attract more converts. Meanwhile, and more subtly, the emotional charge in the unconscious is building and eventually leads to a counter movement. Thus, members of crowds cannot rationally explain their trading behaviour because it was unconsciously driven, induced by embodied simulation and skewed numbers. An example may clarify the latter. The current climate of artificially low (i.e. zero-bound or even negative) interest rates may 'rationally' induce investors to move into risky assets, but it undoubtedly unconsciously induces a misplaced lack of fear for the unknown, a massive blind spot. In the final analysis, the "ratio" is itself a number symptomatic for the ordering by numerical archetypes. Numerical archetypes are mandates that only care about (the survival of) the total market, and inspire individuals to individuate by contrarian thinking in order for the market's mind to rebalance. It means that the bigger the complexes of the crowd (e.g. hypes) the more profound the impact of the eventual market correction.

Specifically, confabulation relates to the numerical, respectively narrative, as follows:

- 1) It quantifies price, emphasising the signalling property;
- 2) It objectifies the narrative, emphasising the logic.

The first causes investors to lose sight of the symbolic nature of price, i.e. the reflection of something unknown. The second distorts the imaginative myth, which originally inspired the search for discovery, and now turns it into an official storyline. Combined they provide the illusionary veil of control and determination over the 'inconvenient truth' and discomfort from an uncertain environment with potentially

nasty surprises. In turn, such crowd thinking suggests, for example in Myers-Briggs (dichotomy) terms, that the market's mind:

- has tilted too far to Introversion along the Extraversion-Introversion scale;
- and/or has tilted too far to Sensing along the Sensing-Intuition scale;
- and/or has tilted too far to Thinking along the Thinking-Feeling scale;
- and/or has tilted too far to Judging along the Judging-Perceiving scale;

It is in that state, where the overreliance on (collective) rationalisation threatens the broader system that the collective consciousness needs to be compensated via the unconscious. As aforementioned, the way it achieves this is via individuation, i.e. instigating contrarian psychology at the individual level. For the individual investor, to oppose the consensus, is a difficult process, as is the resulting re-discovery of true symbols in hyped markets:

Only the passionate yearning of a highly developed mind, for which the traditional symbol is no longer the unified expression of the rational and the irrational, of the highest and the lowest, can create a new symbol. . . . For this collaboration of opposing states to be possible at all, they must first face one another in the fullest conscious opposition. This necessarily entails a violent disunion with oneself, to the point where thesis and antithesis negate one another, while the ego is forced to acknowledge its full participation in both. If there is a subordination of one part, the symbol will predominantly be the product of the other part, and, to that extent, less a symbol than a symptom . . . a symptom of the suppressed antithesis. . . . Since life cannot tolerate a standstill, a damming up of vital energy results, and this would lead to an insupportable condition did not the tension of opposites produce a new, uniting function that transcends them. (Jung, CW6, para. 823-824)

On the other hand, let's assume (as some do) that external surprises are no externalities and can be guarded against. It means that the market can be partly isolated from the larger system. The way this is achieved in practise is via artificial

barriers, like trade restrictions, subsidies, capital controls, non-transparency (e.g. shadow banking, OTC), etc., which cause the denominator of the ratio to be filtered or constrained. It also means that the system builds up 'overcapacity' in terms of generating the innovations in the numerator. Consequently there is no effective use for these, i.e. they become a waste. Resources are no longer properly allocated. In terms of the Red Queen principle, aka the arms race, there is no need to run to stay in the same place. The system becomes 'lazy' with all the implied risks involved. I have more to say on this in section 8.5.

We now return to a key numerical activity involved in investment: calculation. The inputs, as well as the end result of this calculation are numbers, mostly prices. Calculation is the analytical process for transforming one or more inputs into one or more results. In terms of origin, the word calculation is based on the term *calulare* which indicates the counting of numbers with beads (or pebbles). *Calulare* was already in use during the early Roman times. The Romans, like the Greeks and other cultures, often calculated by moving and placing pebbles (*calculi*) around a flat surface (*abacus*) marked out in squares. It followed the earlier terms *numerare* and *computare* which both meant 'to reckon' and 'to count' (on one's fingers). Another interesting historic fact is that early scientific attempts to use calculation focused on time measurements, i.e. to determine the calendar.<sup>167</sup>

The link between calculation and computation is therefore historically strong. For our purposes, the main distinction I'd like to make is that calculation is preserved to the human brain and refers to the mental transformation of numbers, particularly large numbers, whereas computation is the physical transformation of numbers (i.e. bits) by computers. In other words, and in the spirit of both Searle and Penrose, I invoke

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<sup>167</sup> See Borst (1993) for more details.

the distinction between a transformation performed by a biological entity (calculation by a human brain), and a transformation performed by a machine (computation by a computer).

The definition of calculation also refers to the analytical, which in respect of investing can be interpreted as the conscious effort to determine the intrinsic, or 'true', value of a security. In terms of behaviour, and viewed per security, a calculation can lead to a trade, i.e. a buy or a sell. It should be clear that the distinction between calculation and computation in practice gets blurred, because of the intense and growing interaction between both processes in modern finance. However, complexity theory has shown the limitations of computation, in particular via invoking Gödel's incompleteness theorem, the topic for the next section.

### 8.3 COMPLEXITY AND FINANCE

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Complexity theory has produced serious challenges to the assumptions underlying the REH in general, and the EMH in particular. As discussed in Chapter 2, the relevance of complexity for my thesis lies in the applicability of the concept of a complex adaptive system (CAS) to the human and, by extension, to the market's mind. In particular, I argued that complex psychology provides a robust and practical explanation of how the human mind satisfies the requirement which is the sine qua non of any CAS: the ability to endogenously generate innovations within the system (i.e. internal surprises) in order to deal with exogenous events (i.e. external surprises).

In this section I will follow-up by more formally criticising the dominant thinking in finance, i.e. EMH. My approach is to detail my simplified interpretation of the complexity issues involved in modern finance via Algorithmic Information Theory (AIT, aka Kolmogorov Complexity) which is a special interpretation of the Gödel-Turing framework. I loosely follow Chaitin (e.g. 1982, 1987, 1998), one of the founders of AIT. AIT enables the formal assessment of the (level of) complexity of a system, as well as any theory of that system. It particularly equates the complexity of a system with the size (in bit-strings) of a program that produces the (exact same) output of that system. The fact that prices are concentrated units of information, ultimately expressed in bits, makes this approach highly relevant, for example.<sup>168</sup> As far as I know my application of AIT to criticise EMH is novel.<sup>169</sup>

From the outset I introduce the following general principles:

- Assets are traded on markets via securities. For simplicity I assume there is one market per asset whereby that asset is traded via multiple securities. The value of an asset is determined via the no-arbitrage principle whereby a price of one security can be replicated by combining those of other securities.
- The number of securities in a market determines the relative completeness of a market. In other words, by increasing the number of securities traded on it, a market becomes more complete;

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<sup>168</sup> As an aside, despite their differences there is a surprising agreement between EMH and technical analysis (TA): prices contain all fundamental reflections, news, etc. TA subsequently makes one additional assumption: the market discounts everything except its own behaviour, i.e. the information generated by market action itself which impacts participants. This assumption of supplementary information disagrees with the weak version of EMH.

<sup>169</sup> Still, for empirical AIT-inspired research, e.g. tests, on the properties of market data see, for example, Zenil and Delahaye (2011); Giglio, et al. (2008); Chen and Tan (1999).

- In the limit I accept Cramer's Rule in the sense that as soon as the number of securities equals the number of states, the market (and more broadly the economy) becomes deterministic (it is 'fully complete').
- I now introduce game theory's Common Knowledge (CK):
  - o World events, i.e. news, provide the fundamental signals that trigger the market's calculations. These signals are transported through the network of which markets are part. In terms of the CK puzzle, the world 'announces' to the market that there are 'wrong' prices among securities.
  - o We assume that the number of securities,  $n$ , in a market is at least one larger than the number of wrong prices,  $k$ .
  - o Calculations involve the algorithm, i.e. price function, to compare prices. The price is not known intrinsically for each security but can only be determined by comparing it with prices of (combinations of) 'similar' securities within the no-arbitrage framework.
  - o The costs of trading consist of running this algorithm. Specifically, the costs involve units of computer time to do calculations.
  - o In general, for  $k > 1$  news is ' $(k^n - 1)$  knowledge' in the market and requires  $k^n$  units of computer time to calculate prices which are 'corrected', i.e. to maintain no-arbitrage, by way of trading.

To appreciate the motivation of using AIT, let's begin with the following statement by one of the founders of postmodern economics and the REH, Robert Lucas:

I prefer to use the term 'theory' in a very narrow sense, to refer to an explicit dynamic system, *something that can be put on a computer and run*. This is what I mean by the 'mechanics' of economic development - the construction of a *mechanical, artificial world*, populated by the interacting robots that economics typically studies, that is capable of exhibiting behavior the gross features of

which resemble those of the actual world. (1988, p. 5; emphasis mine)

This is, in fact, what Turing's Universal Computer facilitates as interpreted by AIT. Any theory entails a model of a (formal axiomatic) system (FAS) which produces its output after calculations. In turn, and specifically, AIT considers a computer program to be a theory for its output and both theory and output are finite strings of bits whose sizes can be compared. Specifically, the size of the program amounts to the number of bits (i.e. in the software) that implements the theory. This size can be compared to other 'bit-sizes' to determine (the level of) complexity. Schematically:

**General:** Program => Universal Computer => Output

So, complying with Lucas, a theory is the program that a universal computer runs, i.e. which executes its calculations from which it produces the program's output. In our case this means that a theory of the market is the program, Lucas' "artificial" (or model) market, which a universal computer runs, whereby it executes 'calculated' trades, with prices as their output. Schematically:

**Finance:** Market => Trading => Prices

This initial set up or model thus simulates a market with the following assumptions, A.1 to A.6:

1. A market,  $M$ , executes trades in security  $S_n$  (with  $n = 1 \dots N$ ;  $N$  being the number of securities).
2. The size of  $M$ , expressed in (strings of) bits, is determined by  $N$ , i.e. as a minimum.
3. A price,  $P_n$ , of  $S_n$  is the numerical output of  $M$ . Specifically, it is the result of an actual trade in terms of the amount of money exchanged for  $S_n$ .

4. A value,  $V_n$ , of  $S_n$  is the numerical input of  $M$ . Specifically, it is computed by the price function,  $H_n$ , as the fair amount of money exchanged for  $S_n$ . after comparing the prices of all securities in  $M$ . It is fair in the sense that, if a trade would take place at  $V_n$ , it would reflect an equilibrium between the quantities of supply and demand of  $S_n$ .<sup>170</sup>
5. A trade,  $T_{n,i}$ , in  $S_n$  is executed if  $P_n \neq V_n$  whereby the absolute risk-adjusted difference between  $P_n$  and  $V_n$ ,  $R_{n,i}$ , exceeds any trading costs,  $C_{n,i}$ .<sup>171</sup> In symbolic terms:  $T_{n,i} = \text{IIF}(R_{n,i} > C_{n,i})$ .
6. Ignoring subscripts,  $M$ , using  $H$  on input  $V$ , computes  $P$ , or  $M(V) = P$ .  $M$  halts if it reaches equilibrium, i.e. executes  $T$  at  $V$ . If  $M$  never halts it means that no  $T$  at  $V$  exists and  $M(V)$  is undefinable, in symbolic terms  $M(V) = \neg$ .

The (semi-strong) EMH, as the dominant theory, argues that in an efficient market prices almost instantly reflect all available relevant information. It means that, at any point in time,  $P$  is so close to  $V$  that any  $R$  implied by the difference between the two is negligible compared to  $C$ .<sup>172</sup> Effectively this means that  $M$ , employing  $H$ , always leads to  $P = V$ , i.e.  $M$  is in equilibrium.<sup>173</sup> We call this state "minimally rational" (Rubinstein, 2001, p. 18) or minimally efficient.<sup>174</sup> It also implies that the market "knows more than any individual investor can know." (Bernstein, 1992, p. 136).

In view of the above I make the following statements:

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<sup>170</sup> Although here  $V$  stands for "equilibrium value", I would argue that in this Gödelian context it is just as applicable to any value concept that acts as an aggregated input from an implicit computation.

<sup>171</sup> We assume  $C > 0$ , i.e. in trading there are always costs involved. The individual buyer and seller involved in  $T$ , by definition, agree on  $P$ , on  $\text{abs}(R) > C$ , but not on  $V$ . In fact, they don't know  $V$ , but make their own estimate,  $E(v)$ . According to the EMH,  $V$  equals the aggregated  $E(v)$ 's.

<sup>172</sup> This argument is not inconsistent per se with A.4/5. It just states that a trade "is not worth it."

<sup>173</sup> As an aside, the problem of the EMH in light of A.4/5 is that no trade takes place. Admittedly, others have made the same point but with different arguments (e.g. Grossman and Stiglitz, 1980).

<sup>174</sup> It is (indirectly) related to Markowitz efficient portfolio.



1. Finance's version of the liar's paradox is: "This price is false". Specifically, this should be interpreted as: Price equals Value is false. Translated in a theorem:  $P = V$  is unprovable.
2. Finance's version of Turing's halting problem is: there does not exist an H which can decide whether M halts.

Furthermore, I derive the following preliminary conclusions:

- a) If the theorem is false, that is if  $P = V$  is provable, then the EMH is inconsistent because it means that P actually exists, that is to say as an output which, following A.3, implies that one can trade P at V. But no trade exists according to A.5, i.e.  $T = 0$ ;
- b) If the theorem is true, that is if  $P = V$  is unprovable, then the EMH is incomplete because of its halting problem: H cannot decide whether M halts, i.e. reach equilibrium.

The second conclusion is based on complexity theory which argues that the halting problem is unsolvable:

The most interesting thing about the idea of program-size complexity, of measuring the complexity of something by the size of the smallest program for calculating it, is that almost every question you ask leads straight to incompleteness. Wherever you turn, you immediately smash into a stone wall. Incompleteness turns up everywhere. (Chaitin, 1998, p. 15)

In this case, there is no effective procedure to determine whether a market stops trading, i.e. whether a market actually is in equilibrium and outputs a P which equals V. This follows from AIT's argument that data follows a law (e.g.  $P = V$ ) only if the model for calculating it (and by extension the underlying theory) is smaller than the data it explains. In the spirit of Occam's razor, an efficient model (again,

implemented via a program) is the smallest model possible to produce the output it does. Its output is minimally complete if the size of the output is larger than that of the model which produces it. In our case, if we assume one P per S, as well as one bit per P, the size of M in bits is at least N. In other words, to qualify as a true "efficient" model, bit-wise M needs to be smaller than the prices it produces while including the equation that represents (proof of) equilibrium. From this, we can show that proving whether a market is efficient and minimally complete is not possible.

To do that, I link AIT to the concept of complete markets (e.g. Arrow and Debrue, 1954)<sup>175</sup> which states that a larger market means more securities, e.g. derivatives, which increase its completeness. Back in AIT-terms, at the minimum the size in bits of a 'model-market' is equal to the number of securities and a larger market thus means it is more complex, i.e. contains more bits.

First, we assume the opposite of what we want to prove is true. Namely, assume that there is a general 'valuation-checking' market<sup>176</sup> that can decide whether any market will halt, i.e. has reached equilibrium. From this assumption we shall derive a contradiction, a 'reductio ad absurdum' proof. Next, I introduce the following situation: M' is our valuation-checking market which produces the output of the first provably efficient market that is minimally complete. This leads to assumption A.7:

7. There exists a market, MM, that is larger than M if it executes trades in more securities than M which simultaneously makes it more complete. The above assumptions A.2 to A.5 also apply to each security listed in MM. MM only halts if each of its securities has been traded, i.e. all trades have been executed to the point of equilibrium.

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<sup>175</sup> For a less technical explanation, see Flood (1991).

<sup>176</sup> Again, think "model-market" here.

$M'$  embodies its own size in bits, say  $X$ . This means that there is sufficient space in  $M'$  for it to contain the number  $X$  itself. Next, employing  $H$  (which  $M'$  contains as a subroutine)  $M'$  takes a look at all markets larger than  $X$ , say up to  $100X$  bits in size, to check which halt, i.e. reach equilibrium, and which do not. Then  $M'$  runs all the markets that halt to determine the output that they produce. Their output has to be larger than their respective sizes in order to be called a "provably efficient market that is minimally complete". The output will be a set of prices with a degree of complexity (i.e. the number of bits required for their description) up to  $100X$ . Finally,  $M'$ , our valuation-checking market, outputs the smallest positive integer not in this set, that is, with complexity greater than a hundred times  $X$ . And then  $M'$  itself halts.

So  $M'$  halts, its size is  $X$  bits, and its output is a number that, according to EMH, cannot be produced by a market whose size is less than or equal to  $100$  times  $X$  bits. But  $M'$  has just produced this integer as its output, and it is much too small to be able to do this, because the size of  $M'$  is only  $X$  bits, which is much less than  $100$  times  $X$ . A clear contradiction of the EMH as FAS if it is to remain consistent!

Let me rephrase this via a variation.  $M'$  runs through the tree of all possible proofs (i.e.  $P = V$ ) in the theory (i.e. EMH), searching for the first proof that an individual market,  $M''$ , is minimally complete, for which it is also the case that the size of  $M''$  in bits is larger than the size of  $M'$  in bits. When  $M'$  finds  $M''$ , it runs  $M''$  and then  $M'$  produces as its output the output of  $M''$ , after which it halts itself. But again,  $M'$  is too small to produce that output as it cannot produce the same output as a provably efficient market that is minimally complete, that is if EMH is to be consistent.

In fact, what this shows is that  $M'$  can never find  $M''$ , the first provably efficient market that is minimally complete. More generally in AIT, a procedure  $H$  for deciding whether or not programs ever halt cannot exist, for if it did then we could actually

construct this paradoxical program using H. The complexity of a theory just the size of the smallest program for generating all the theorems of that theory and the above shows that if a program  $M''$  is more complicated than the theory, the latter cannot enable you to prove that  $M''$  is efficient and minimally complete.

Moreover, the EMH states that each price of a complete N-securities market contains all relevant information and that any price move of a particular security is random. Following Chaitin (1982) as well as others, let's again consider such a market as a formal axiomatic system, A, for listing a set of theorems. The size of A is N, equal to the number of securities. In this case, there exists a market, M, of size N which lists its set of theorems as  $(P = V)_i$ , with  $i = 1, N$ . Now toss an unbiased coin slightly more than N times. It is almost certain that the resulting binary string will be algorithmically random, but it is not possible to prove this within A. Chaitin argues that "In fact, within an N-bit formal axiomatic system it is not even possible to prove that a particular object [P.S.: a security's price] has algorithmic information content greater than N, even though almost all . . . objects have this property" (1982, p. 946). Punchline: you need an N-bit theory to proof that an N-bit market is efficient; nothing smaller will do.

#### **Summary Note**

In the context of Lucas' earlier view, allow me to summarise how AIT's use of "math", "programs", "bits", "length" and "print" can be applied to "EMH", "markets", "prices", "size" respectively "quote".

AIT says there's some length (size) L, such that you can't prove any particular string of bits (prices) needs a program (market) longer (larger) than L to print it out (quote). That is to say, if math (EMH) is consistent. If it's not consistent, then you simply can't prove anything. At the same time AIT also states there's some finite number of programs (markets) of length (size) L. So if you take a list of more numbers than that, for example 1, 2, ... , N, there will be at least one that needs a program (market) longer (larger) than L to print it out (quote).

Assume there is just one: Then we can go through all programs (markets) of length (size)  $L$ , find those that print (quote) all the other numbers on our list and thus, by a process of elimination, find the program (market) we are looking for.

However, that means we've proved that this is a number that can only be computed by a program (market) of length (size)  $> L$ . And AIT says that's impossible! That is to say, again, if math (EMH) is consistent.

Can there be more than one? No, because we can apply the same logic for each step, all the way up to  $N$ , until we rule out all the possibilities, at which point we get stuck.

In short, if math (EMH) is to remain consistent we get a contradiction.

Furthermore, implicit in the view presented here is the argument that the complexity of a market (and by extension its theory) is positively correlated with the number of prices in that market. More important is the observed fact that the complexity of a market reaches its pinnacle, i.e. randomness, as the number of prices, is extended. In general, as I have maintained above, this means that a larger number of securities is traded. However, this can be disputed if a smaller market, in terms of number of securities, can produce the same output. For example, instead of so-called pure securities this market contains complex securities with pay-outs for multiple states (outcomes). But, again, it is 'AIT-unprovable' that such a market can exist.

As far as the link between Gödel and Jung is concerned, this has been described, among others, by Robertson (1995). Recently I provided my own view on this (Schotanus, 2013). The next section details additional Jungian reflections on price and its discovery.

## 8.4 PRICE TAKES THE STAGE

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Let me repeat why this thesis contributes to complex psychology. I argue that price discovery in the financial system provides exactly that what Jung himself was unable to find elsewhere during his lifetime: a means to measure collective psychic energy numerically, in the context of numbers bridging the physical with the mental (von Franz, 1974, p. 157).

In this process, by which investors attempt to deal with uncertainty as they are confronted by the unknown, the central question put forth to the collective investor unconscious is "what is the true value of this security?" Apart from the almost exclusive reliance on analysis, this question itself already leads to tension because for each trade the seller and buyer agree on price, but not on value. A trade, resulting in a price, thus reflects at the same time agreement and disagreement. This touches the core of Jung's psychology, the implicit duality of symbols. It also points to the elusiveness of "equilibrium" in capital markets. Specifically, price itself is divided. On the one hand, the unity of the phenomenal and the hidden (Jung's *unanschaulich*) produces the realisation of information, i.e. the price's signal, in the cognitive domain. On the other they escape capture because it would jeopardise the market's intrinsic ability to "surprise". In short, price has to remain symbolic. Prices reveal the empirical fact of the numbers at which level trades, the exchange of monies, took place. At the same time they conceal the hidden true values of the concerned securities, even the buyer and seller's estimates for these values in the 'back of their minds'.

Following Giegerich (2007), at the macro level prices are "the garb or garment in which the irrepresentable" market's mind manifests itself. Giegerich calls the implied dynamics within a symbol its "logical drama". Applied to the market, with price as its symbol, we can read the following script:

- 1<sup>st</sup> act: the market's mind emerges in disguise. It expresses itself in symbolic garb and manifests itself phenomenally, i.e. it makes itself visible by way of price, the number realised (i.e. experienced) when an exchange takes place. The collective investor unconscious represents itself in this symbol which speaks in its name.
- 2<sup>nd</sup> act: the phenomenal aspect of the price negates itself. It says: "My appearance, the way I look, is not what I'm about. Don't take me at face value. In fact, I'm not really about value at all."
- 3<sup>rd</sup> act: the phenomenal aspect of the price pushes itself off from itself and points to something hidden, an implied "other", invisible as to that which it is actually about. It says: "In truth, I am about this non-phenomenal other".
- 4<sup>th</sup> act: the price says "But only through me, this garb, can you get access to this other. The latter is not wholly other, not anything outside of me, like you, the trader, do not exist outside and independently of your trades. That other to which I point out, as that which I am actually about, exists exclusively within me; there is nothing behind me. I am its valid and true representation, its best possible representation. In fact, that other represented by me exists only through me, is produced by me, posited by and within myself, precisely through my negation of myself."
- 5<sup>th</sup> act: the price clarifies its own negation: "Because my meaning is absolutely negative, I really mean nothing, not in the sense of total emptiness, but in the sense that I mean exactly what I phenomenally show and represent."

As Giegerich points out, the symbol is this internal drama with all five acts acted out simultaneously. In terms of price, what from the outside appears as a simple static number, a unitary phenomenon is, viewed from within, a dynamic drama. It is dynamic for two reasons.

First, the 'logic' of the drama is, as it were, 'behind the mask' of price and the logic of the symbol is:

a circular, uroboric logic. The end result of this logical drama (PS: 5<sup>th</sup> act) returns to where we were at the very beginning (PS: 1<sup>st</sup> act). But this does not imply that we could simply eliminate and forget about the intermediate acts of this drama. No, the end contains all the stages that the movement passed through within itself, so that the end is not at all identical with the beginning. It is immensely enriched. (Ibid, p. 260)

Second, this drama unfolds in an expanding but endless chain, as each symbol generates mental reflections (i.e. price discovery) and behavioural reactions (i.e. trades) which, in turn, create new symbols. Those new symbols include not only new prices, but also (add to) their patterns and the dramas they represent. In other words, the logical drama within the price is acted out on the larger stage of the market due to the dynamics of duality. This, for example, makes price the ultimate fractal (see also below). As previously discussed, this never-ending story also embeds confabulations.

Another way to represent the duality of price is via the well-known Taoist Yin-Yang symbol:





Imagine prices (and their patterns) to contain both a yin and a yang aspect. In particular, we could think of price to reflect the real 'hard' current cash (for the seller), as well as the imagined 'soft' future benefit (for the buyer). We can build on from there<sup>177</sup>:

1. Yin and yang do not exclude each other, rather they complement. Everything has its opposite: although this is never absolute - only relative. No one thing is completely yin or completely yang. Each contains the seed of its opposite. For example, 'what goes up, must come down': a bullish price has a bearish shadow.
2. Yin and yang are interdependent. One cannot exist without the other. For example, reward cannot be gained without risk. Each return has its volatility.
3. Yin and yang can be further subdivided into 'smaller' yins and yangs. Prices and their patterns are fractal in nature. Within each spectrum, there is a smaller spectrum. Every pattern is a phase in time of which its

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<sup>177</sup> Freely adapted from [http://psychology.wikia.com/wiki/Yin\\_and\\_yang](http://psychology.wikia.com/wiki/Yin_and_yang) .

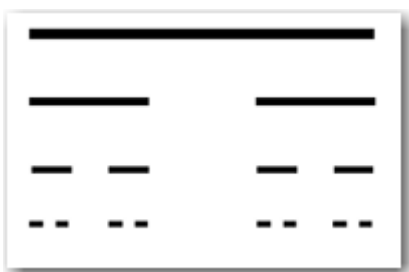
closing price embodies its historic path, of 'how it got there'. At the same time, that price is the beginning of its future path, embodying its potential.

4. Yin and yang consume and support each other. Yin and yang are usually held in balance: as one increases, the other decreases. However, imbalances can occur: by excess of yin there is a yang deficiency and vice versa. The imbalance is also a relative factor: the excess of yang 'forces' yin to be more 'concentrated', like a crowded trade.
5. Yin and yang can transform into one another. At a particular stage, yin can transform into yang and vice versa. For example, a bear morphs into a bull. However this transformation is relative. Bears and bulls can coexist in the financial system.
6. Part of yin is in yang and part of yang is in yin. As the picture above shows, the dots in each serve as a reminder that there are always traces of one in the other. For example, there are always green shoots in every recession, there is always the contrarian within the crowd.
7. These dynamics are a reminder that extreme yang at some point transforms instantly into yin, and vice versa, or that the labels yin and yang are conditioned by an observer's point of view. For example, the steepest trend is easiest to break. This can show that absolute discrimination between the two is artificial.

We can extend the Yin Yang symbol to another Chinese numerical symbol, namely the hexagrams of the I Ching. For example, this is Hexagram 4:



As an aside, it is striking how these represent combinations of Cantor sets, to the point of Cantor dust, a well-known pattern in chaos theory:



From these symbolic numerical patterns I will now move to price patterns.

## 8.5 PATTERNS IN PRICE

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Prices (for the Dow, Nasdaq, US Treasury Bond, Brent Oil Future, etc.) become the numeric symbols in the process of finding order by investors, e.g. "The Dow 10,000", "The 666 SPX", "\$100 oil". Over time, apart from hard cash emotional energy has been invested along this 'path of prices', and revelations of the 'true value' are reflected in (violent) moves in price. The resulting price patterns become the symbols that reveal, to some directly but for most in hindsight, the mystery. In the spirit of what I wrote in 8.2, Peter Bernstein (1996) notes: "After the fact . . . when we study the history of what happened, the source of wildness appears to be so obvious to us that we have a hard time understanding how people on the scene were oblivious to what lay in wait for them." The crash of 1929, the burst of the

internet bubble in 2000, Lehman's collapse, and generally patterns in technical analysis, like the "Head and Shoulder", are obvious examples of these stories.

Thus, price is established at each point in time as, in Jung's own words, "the best possible expression at the moment for a fact as yet unknown". This leads to tension and is the reflective source for dealing with uncertainty. Any (perceived) increase in external surprises (either in size or number) is compensated, in a healthy mind, by increasing the (size or number of) innovations. However, the tendency within groups (influenced by unconscious induction) is to feel less vulnerable and more secure by focussing on a shared explanation, i.e. consensus.<sup>178</sup> I call this process participation confabulation (e.g. explaining away surprises, errors, and the like), not only because the group represses internal novelty<sup>179</sup> but also because it has to sound convincing from a cognitive point of view: only rational arguments have the power to repress the pushback from the (contrarian) emotional feelings of individual non-believers, albeit only for so long. Consequently, and most clearly observed during the formation of a financial bubble, the imbalance grows, or rather feeds on itself, as the shared views of investors increasingly become one-dimensional. The link between the collective unconscious and quantum-physics is thus fairly intuitive: investors attempt to estimate a move along space and time of an object they cannot objectively observe. Furthermore, the concept of number sense has taught us that large, i.e. growing, numbers are projected in space to the right and, in fact, are associated with growing uncertainty, i.e. decreasing accuracy in our estimation. Let's try to visualise this in a moment.

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<sup>178</sup> Along the lines of "If we stick together we stand strong and can face this uncertainty".

<sup>179</sup> Along the lines of "We need to focus and not allow distractions. So don't bother me with your insights, we 'know' how to deal with this crisis."

But first, let's return to Jung's emphasis on the importance of the first four natural numbers. I repeat the following quote because it is so crucial, in this case providing an appropriate prelude to the Binarius, my definition for the most basic price formation which I will introduce shortly:

one is not a number at all; the first number is two. Two is the first number because, with it, separation and multiplication begin, which alone make counting possible. With the appearance of the number two, another appears alongside the one, a happening which is so striking that in many languages 'the other' and 'the second' are expressed by the same word. . . . The 'other' can have a 'sinister' significance—or one feels it at least, as something opposite and alien. . . . Two implies a one which is different and distinct from the 'numberless' One. In other words, as soon as the number two appears, a unit is produced out of the original unity, and this unit is none other than the same unity split into two and turned into a 'number'. The 'One' and the 'Other' form an opposition, but there is no opposition between one and two, for these are simple numbers which are distinguished only by their arithmetical value and nothing else. The 'One', however, seeks to hold to its one-and-alone existence, while the 'Other' ever strives to be another opposed to the One. The One will not let go of the Other because, if it did, it would lose its character; and the Other pushes itself away from the One in order to exist at all. Thus there arises a tension of opposites between the One and the Other.

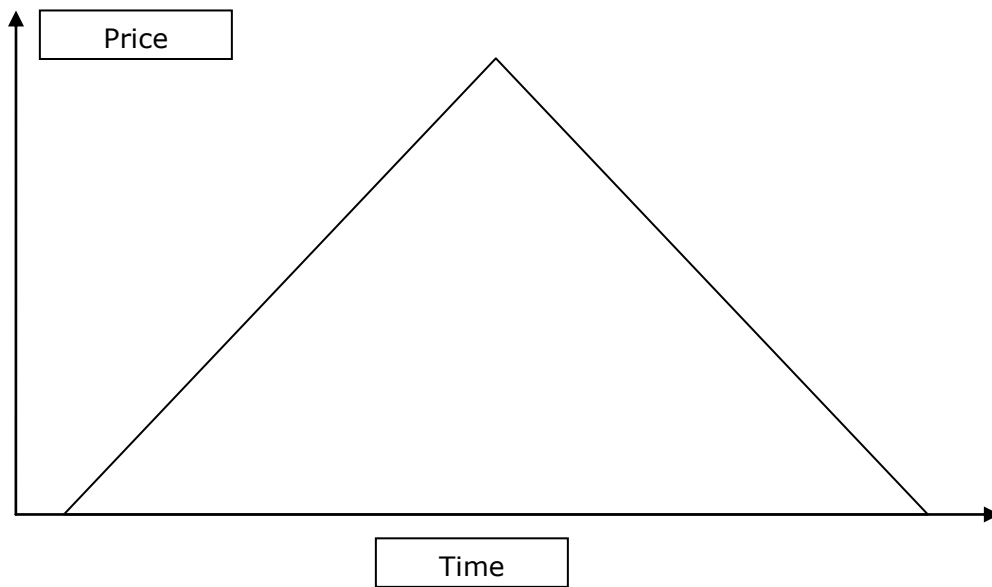
This "tension of opposites" leads to Jung's concept of enantiodromia. It basically is the psychological version of reversal and equilibrium in the sense that it counterbalances the overarching tendency. In Jung's words:

This characteristic phenomenon practically always occurs when an extreme, one-sided tendency dominates conscious life; in time an equally powerful counter-position is built up, which first inhibits the conscious performance and subsequently breaks through the conscious control. (CW6, para. 426)

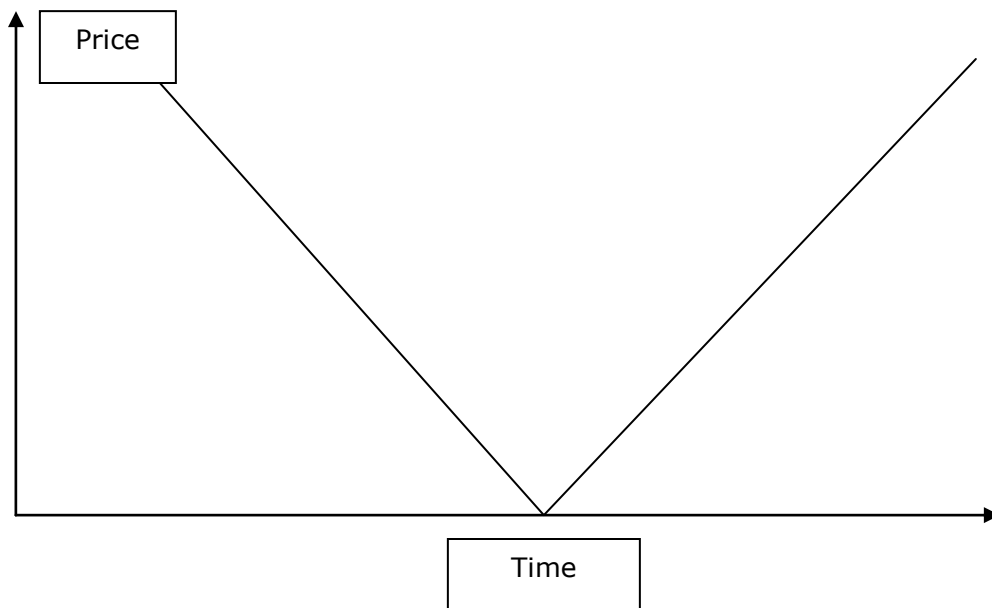
Enantiodromia became a key aspect of the archetypal hypothesis. It is the corrective mechanism which provides an archetype with its binary nature: the two opposites which complement one another. We can place this in the quarternity concept of Jung, i.e. 4 squaring the circle:

1. An impulse leads to "an extreme, one-sided tendency" away from the origin.
2. The emergence of a new symbol (e.g. number) not only suggests that the archetype is projecting its archetypal image ('the unit out of the original unity'), it also suggests enantiodromia is operational, i.e. the counterbalancing force has become active.
3. Initially this force only inhibits conscious control, i.e. it is restraint. But "every tension of opposites culminates in a release, out of which comes the 'third'. In the third, the tension is resolved and the lost unity is restored. Unity, the absolute One cannot be numbered, it is indefinable and unknowable; only when it appears as a unit, the number one, is it knowable, for the 'Other' which is required for this act of knowing is lacking in the condition of One.
4. Eventually a resolution, as in renewed equilibrium, completes the correction. The completion of three means the squaring of the circle by four, in Von Franz's terms (see below). However, at the same time it creates the set-up for the next impulse.

This leads to my naming and definition of the most basic price formation which is at the core of all price patterns: the Binarius. The Binarius is formed once the price retraces to a previously attained level. Assuming the time dimension along the x-axis and price-level along the y-axis, it looks like this:



Its mirror image is the reversed Binarius:



This image has several important implications:

- Binarius contains 2 moves. The initial price move in one direction, graphically represented as the left leg, is technically not a pattern, only a line. In Jung's terms, it is the "numberless" one. It is the connection between the base and space, nothing and (pointing to) something. It is this move, which plants the seeds for disequilibrium, as well as for the build-up of the emotional charge.
- The second move is equal, but opposite to move one. Once it has emerged it contrasts the one as "the other". As it appears, uncertainty is revealed for the first time. In technical terms, there is price action (impulse move), followed by price reaction (correction move).
- Binarius reflects both disequilibrium, as well as equilibrium. Disequilibrium is at its extreme point in space, equilibrium is the return to its base. In technical terms, it reflects a full reversal, whereby the return of one leg is equal, but opposite to the other leg<sup>180</sup>.

So, archetypically the number 2 represents duality. It is the archetype for division and repetition. It enables the formation of Yin and Yang. It signifies the start of the formation of Cantor dust. Furthermore, it is also identified by Maturana and Varela as the number that allows distinction between the individual entity and its surroundings, which is at the centre of awareness, again echoing Jung. In financial markets, it captures bull and bear phases.

The completion of the Binarius reveals the uncertainty, and is the prelude to the next move, move number 3, the first leg of a new Binarius. Let's repeat what Jung states:

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<sup>180</sup> Measured from the initial point.



But every tension of opposites culminates in a release, out of which comes the “third”. . . Three is an unfolding of the One to a condition where it can be known—unity becomes recognizable; had it not been resolved into the polarity of the One and the Other, it would have remained fixed in a condition devoid of every quality.

This brings us to the interpretation of those sections in price moves which didn’t see any reversals (yet), i.e. Ones without a Two. In other words, a straight line only.

This is fairly intuitive: there is no conscious uncertainty, the numbers reflected in the prices along this path have no quality (yet). Technical analysts will recognise this as price levels where there is no indication of support or resistance. The space is a void, without any reference of having been there. Although this invokes images of infinity and other “Godlike” properties, such a move plants even stronger seeds of reversal exactly because of this. The only asset which we ‘know’ will, in principle, continue as a straight line is the price index of cash. It is ‘risk-free’.<sup>181</sup>

This leads us into the next chapter which will discuss Archetypal Valuation as a framework of thinking within which a new investment research method (see chapter 10) is embedded.

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<sup>181</sup> I ignore the risk of debasement of the underlying currency, default by the sovereign, etc.

## CHAPTER 9. ARCHETYPAL VALUATION: PSYCHURITIES AND PORTFOLIOS

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*I suggest getting to know your feelings, by experiencing them, expressing them, letting them pass through*

*Ed Seykota, trader*

### 9.1 INTRODUCTION

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Modern finance has dealt with valuation from an outdated materialistic, i.e. mechanical, paradigm. It assumes that such assessment is largely rational and, in line with the natural sciences, that the investor can be separated from the market to make objective observations. Instead, as I have argued in the previous chapters, the movements in price and related data within the financial system reflect a collective consciousness that is intersubjectively experienced by investors: whatever cognitive impulses lead to buying and selling, they originate in the unconscious and are enriched by sensations. How do we bring these together?

Continuing with the analogy between mind and market, I will introduce in this chapter a portfolio management perspective of mentality. It starts with the view that, reflected symbolically in prices, the process underlying the allocation of physical resources mirrors that underlying the allocation of mental resources. Damasio (1999, p. 82) points out, for example, that attention is “something of a finite commodity” in terms of mental resources. As usual I place special emphasis on

the primacy of the unconscious<sup>182</sup> in the relationship between the objective event and the (inter)subjective experience. As before I emphasise the role of numerical archetypes in mapping the external onto the internal, i.e. as an emerging image, in particular enabling differentiation and integration:

So long as a thing is in the unconscious it has no recognizable qualities and is consequently merged with the universal unknown, with the unconscious . . . But as soon as the unconscious content enters the sphere of consciousness it has already split into the 'four', that is to say it can become an *object of experience* only by virtue of the four basic functions of consciousness. It is perceived as something that exists (sensation); it is recognized as this and distinguished from that (thinking); it is evaluated as pleasant or unpleasant . . . (feeling); and finally, intuition tells us where it came from and where it is going. (Jung, in Von Franz, 1974, p. 121; emphasis mine)

In viewing mentality in general, and the collective unconscious in particular, from a market perspective the reader should keep in mind Jung's earlier words (see 1.1.4) regarding the unconscious: it is like "a collective human being" who, based on "immeasurable experience", is "an incomparable prognosticator" who possesses "a living sense of the rhythm of growth, flowering and decay". To be clear, this does not make the unconscious, nor the market fully perfect or purposeful.

Below, by invoking Roll's second critique, I point to the similarity, at least metaphorically, between the collective unconscious and the 'overall market', both of which can only be inferred. Crucial in the current context is the element of surprise which both exhibit. The aforementioned primacy of the unconscious follows from this: to endogenously (but secretly) generate the internal surprises (innovations) which enable the mind to adapt to external ones. Although mentality includes both Systems 1, e.g. emotion, and System 2, e.g. thought, in terms of dual-system

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<sup>182</sup> In that respect I have more sympathy with, for example, the view expressed by Damasio (1999) and Panksepp (1998) than Rolls' view (2005), although the latter also uses economic metaphors as I will show.

approaches to mind, I will focus on emotions because they are more prominent in complex psychology and are underrated in modern finance.

The investment angle from which I view emotions means that instead of employing the more common computational terminology used, for example, in evolutionary psychology to describe emotions (e.g. 'superordinate programs'), I invoke terminology from portfolio management albeit without the association to modern finance. In the following I therefore assume that the reader is familiar with the basics of portfolio management.

Valuation is central in portfolio management. Panksepp provides a nice confirmation of the primordial status of numerical archetypes as symbolising values at the core of consciousness:

These flickers of consciousness were created by the neural mechanisms that first allowed organisms to behave as internally motivated, coherently functioning creatures that could be proactive as opposed to simply reactive. They would therefore have been emotional in quality—the *precursors of feelings like fear and desire*. The rudiments of consciousness were probably *built upon neural systems that symbolise . . . values—the basic motivational and emotional systems of the brain that inform organisms how they are faring in the game of survival*. (in Carter, 2002, p. 186; emphasis mine)

Apart from the similarities, there remains a gap in the ultimate translation of monetary values of assets and the mental values of emotions which these assets invoke. Although the numbers, represented by prices, form Pauli's "common language" to bridge the physical with the mental, something gets lost in translation. This is caused, first and foremost, by the difference between cognitive expectations and archetypal expectations about value. Whereas the former 'deal in' matters of reason, the latter 'deal in' matters of the heart. As part of the broader 'arms race' within the system, this difference leads to tension and ultimately to price dynamics.

## 9.2 EMOTIONS AS PORTFOLIOS OF PSYCHURITIES

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First, we need to make the distinction between an investment portfolio or IP (which contains securities) and an emotion portfolio or EP<sup>183</sup>. Specifically, emotions can be viewed as portfolios of sector-specific psychological securities, which I call psychurities. A psychurity is simply the finance-inspired term for a single psychological adaptation: its activation or trigger is event-dependent or, in finance terms, 'state contingent'. As such, a psychurity embeds a contingent claim, or payoff. Each EP is structured to replicate a strategy to respond to an event, ultimately aimed at gaining a reward or hedging a risk. The mind consequently forms a multi-layered complex of EPs (a 'fund-of-fund' if you will) which, via allocation and dynamic rebalancing, allows it to seek or avoid exposure to a multitude of circumstances. At the same time, like the fund-of-fund leads to a stream of pay-offs, the combined EPs result in a 'stream of consciousness'.

The values of these EPs are ultimately intersubjectively determined. First, they are appraised via the interaction, in the form of competition and cooperation, between the subcomponents in the individual mind. Specifically, the competition for neural resources in the brain between deliberative thoughts and instinctive emotions is an extension of the broader polarity between the unconscious and conscious forces. Second, they are also appraised via the interaction with other minds. Regarding the latter, mirror neurons seem to play a central role in the collective unconscious assessment of emotions (see Chapter 7). We can consequently view this as a global market of emotions. Together with the local (i.e. personal) market, emotions are

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<sup>183</sup> Again, we can think of System 2 modules, e.g. thoughts, in similar terms, i.e. a thought portfolio, or TP.

evaluated according to their fitness to a certain situation: an emotion becomes more valuable if its payoff, implied by the strategy as a response to the situation, increases the emotional utility of the overall complex of portfolios. Also, due to their ancient existence (making System 1 much older than System 2), the history of emotion valuation is much longer than that of cognitive valuation. (For comparison, the history of gold valuation is much longer than that of oil).

There are four arguments why the EP interpretation is useful in general, and why it is more appropriate than a macro-economic interpretation of emotions<sup>184</sup> in particular.

### **1. Focus on leading indicator of emotions**

In line with my thesis, we are mostly interested in clarifying the earliest phase of the emergence and impact of emotions, in particular instinctive emotions. In other words, we are interested in the leading indicator of emotions. How is this mirrored in the physical world of economics? Capital markets are generally considered the leading indicator for the real economy. They are an economic meta-adaptation in that they solve a crucial economic problem: to allocate capital, in a reasonably efficient way, to investments which eventually find their way into physical assets (i.e. output) of the real economy. In the words of Bill Miller, legendary fund manager of the Legg Mason Value Trust:

One of the things capital markets do is consider possible worlds. The level and direction of prices reflect the markets' assessment of the probabilities of possible worlds becoming actual. There are advocates for many of these views. Investors consider the risks and rewards and allocate their money accordingly.

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<sup>184</sup> See, for example, Neu (2008) on Rolls' theory.

With this interpretation, I use financial investments (i.e. sector-specific securities) as a metaphor: they are the economic equivalent of domain-specific psychological adaptations. Like the latter, securities have a risk/return profile reflecting simultaneously historic experiences and implied expectations. Combined in a portfolio this makes them appropriate responses to (benefit from/hedge against) the stimuli from the real economy. But just like emotions and behaviour are not clearly separable, neither are the capital markets and the real economy. In other words, both embed intricate and complex feedback loops, in particular concerning expectations and actual outcomes, which make cause-and-effect relationships difficult (if not impossible) to determine. Specifically, the complexity arises:

- from the reflexive influence on each other (i.e. emotions on behaviour, respectively capital markets on the real economy, and vice versa for both), and
- from the intersubjectivity between the constituents, particularly the influence of 'the collective' on the individual constituents.

Regarding the latter, whereas individual emotions are correlated to (historic) collective emotions (i.e. themes), individual assets are correlated to the risk factors of the broader markets. In short, a portfolio reflects historic experiences, future expectations, and intersubjectivity. Again, this makes portfolio management so appropriate as a shared and mutually applicable concept between securities and psychurities.

## **2. Focus on valuation**

Using the finance metaphor of securities as the constituents of a portfolio implies that the value embedded in an emotion, as a portfolio of psychurities, is not always

clear-cut and can fluctuate. Specifically, my approach emphasises that there is always a flipside to the return of the psychurity, namely its risk, e.g. the cost of selecting it. This is consistent with the original meaning of responses to stimuli, for example in terms of foraging. The attractive prospect of the stimulus food may not outweigh the cost of obtaining it, i.e. it can be bad or poisonous, too risky to pursue, not adding (diversification) value (i.e. similar food is already available or stored), etc. More importantly, as aforementioned, the value of emotions is 'above all' assessed collectively. This not only concerns 'nature's emotions', that is to say the primordial instinctive emotions which reflect values with a rich history that we commonly share with our ancestors. It also includes 'nurtured emotions': those more social and culturally biased emotions, e.g. morals, which we commonly express in our relationships while we simultaneously are experiencing the same situation (e.g. a family mourning the death of a family member). As discussed previously (Chapter 7), embodied simulation via mirror neurons suggests that the capturing of an expressed emotion by the senses, e.g. via observation, unconsciously already triggers a similar emotion in the observer. In short, emotions may be experienced privately but, like portfolios, they receive their 'objective' appraisal collectively. On that note, a bubble is not only an excessive valuation in financial wealth (e.g. US\$) terms, but also in terms of collective single-minded emotional values, i.e. euphoria.

### **3. Focus on dynamic rebalancing**

Dynamic rebalancing of the weights of the constituents of a portfolio enables in principle the replication of an unlimited array of payoffs. In other words, the concept of portfolio management includes a principle which can explain the flexibility and versatility of emotions in terms of handling the multiple psychurities to react to (changing) circumstances.



#### **4. Focus on price dynamics in capital markets which differs from those in the real economy**

Price discovery in capital markets is different in nature from that in the real economy. Consequently, the relationship between emotions and financial assets is different than between emotions and consumer products. Specifically, the dynamics of supply and demand in response to (extreme) price action in capital markets is counter-intuitive from an economic perspective. For example, in the build-up of a crowded trade demand, in the form of volume, frequently goes up as prices increase. This leads, for example, to the phenomenon of momentum. In short, EP is the proper metaphor to think about 'managing' emotions, at least for those involved in investing.

To summarise, a portfolio management approach to mentality (e.g. emotions) is consistent with and fits within evolutionary psychology. Evolution, via natural selection, has resulted in psychological functions or capabilities directed at solving specific adaptive problems, mainly those that existed among our hunter-gatherer ancestors. Following Rolls (2007) and Panksepp (1998) the problems that confronted our ancestors basically involved the questions of how to gain rewards (pleasure) and/or how to avoid penalties (pain). In other words, the evolved capabilities have economic characteristics: they enable responses to stimuli which suggest either a return (profit) or a risk (loss). These capabilities are adaptations which enhance survival by assessing the risk/return profile of situations and structuring an appropriate payoff. Placed back in the settings of our contemporary 'financial jungle', they enhance, in principle, economic survival and value creation. However, there are two reasons why they not always lead to optimal economic solutions nor enhanced economic fitness:

1. As aforementioned, they also contain a strong historic/primordial bias which frequently does not fit the current circumstances. In other words, the ancient 'nature's jungle' of our hunter-ancestors may not always properly reflect our modern-day 'financial jungle'. For example, whereas nature's jungle led to losses of lives, the financial one leads to losses of livelihoods.
2. They also include adaptations which attempt to optimise an individual's wellbeing, irrespective of the individual's wealth. An example is charity. Translated in utility terms, emotional utility maximisation is not always aligned, and in fact frequently inconsistent with, economic utility maximisation. From a statistical perspective, this is due to issues such as bounded rationality (i.e. incomplete information about the likely outcomes of a series of actions) and the "inability to use optimal algorithms when combining conditional probabilities" (Rolls, 2007, p.410). These conditional probabilities are implied, via their EEA, by the selected psychurities in the emotional portfolios. In Jungian terms, the archetypal expectancies embedded in the emotions, as symbolic expressions of the archetypes, are non-linear.

Although the level of specialisation of these psychological capabilities varies, each reflects its characteristics in the form of a risk/return profile and can thus be considered as psychurities. Combined they require some form of management as argued, for example, by Tooby and Cosmides (2005). Emotions are among the higher-level functions which achieve this via portfolio management: they form portfolios of lower-level, or sector-specific, psychurities. These portfolios, in turn, can become part of higher-level portfolios. Via emotions the mind manages multi-

layered portfolios of psychurities, each characterised by a particular risk/return profile, replicating a strategy with an implied payoff.

At its source the evaluation of EPs involves numerical principles and is guided by the numerical archetypes. Numerical archetypes ultimately provide the subliminal bridge between assets and emotions, matter and mind, as they symbolically emerge, via price discovery, in the form of prices. In general archetypes form the systematic emotion factors around which emotions cluster. This brings us to the next section.

## 9.3 ARCHETYPAL VALUATION

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If one of the challenges of this Ph.D. is to better understand the reflexive workings of the market, the question is to what extent my investment model of the mind, inspired by Jung's archetypal hypothesis, can be interpreted or compared to traditional models of the market? And how does the related research philosophy, which I call Archetypal Valuation, compare to traditional methods of financial analysis? The following clarification could help in particular finance experts who are familiar with those models and methods, although I hope it will be intuitively appealing to others as well.

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### 9.3.1 COMPARED TO TRADITIONAL MODELS

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First, let's take a particular look at the pillar of modern portfolio theory, the Capital Asset Pricing Model (CAPM). The link with complex psychology is that the end-point of the CAPM, namely the second element of Roll's critique (1977) which states that the market portfolio cannot be observed, is the starting point of Jung's model,

namely that the collective unconscious cannot be observed. Specifically, the fact that the CAPM cannot be verified has not prevented investors (nor finance academics) to use the model in one way or another (e.g. Fama and French, 2004). On that note, if we allow Jung's model the same treatment, particularly since it tries to capture similarly elusive behaviour, how far we can extend this analogy?

We can consider the collective unconscious as managing the all-encompassing emotion portfolio, like the market manages the all-encompassing asset portfolio in the case of the CAPM. Although it cannot be observed, Jung's model suggests nevertheless that there are certain systematic emotion factors which can explain the dynamics (e.g. variance) of individual emotions. These "ordering" factors are the archetypes and they symbolically emerge in consciousness, for example via numbers, myths and other symbolic themes. At this point I would like to introduce another pillar of modern finance, the Arbitrage Pricing Theory (APT), which basically is an extension of the CAPM. The APT holds that the expected returns of financial assets can be modelled via a multiple regression as a function of various factors, whereby the assets' respective sensitivity to changes in each factor is represented by a factor-specific beta coefficient. In other words, unlike the CAPM, which 'identifies' the market as its one and only factor, the APT suggests there are multiple factors at work. However, the APT does not itself reveal the identity of these factors which remain elusive. Still, over time various economic (e.g. yield-curve) and style (e.g. momentum) factors have been tried and tested which seem to act as proxies for consistent cross-sectional drivers of asset returns. They seem to capture recurring investment themes which investors buy into or sell out of. They form risk/return patterns, so-called risk premia, to which investors seek or avoid exposure. Indeed, this sounds very similar to the role of archetypes. Obviously Jung

never actually ran regressions across the emotions of his patients (as expressed in their dreams, etc.) nor across the emotions he identified in historic accounts of myths, religions, and art. Nevertheless, in his analysis he found consistent thematic factors reflected in the form of archetypal images.

#### **Investment Note<sup>185</sup>**

Like the APT's risk factors, archetypes are elusive but a number of them have been identified. Similarly, the 'expected' value of an archetype can be compared to the expected value of the premium of a risk factor. More specifically, the expected archetypal value can similarly be viewed as the outcome of a cross-sectional regression over an extremely long historic period, which makes it rather stable. Archetypal values also cannot be fully replicated, only mimicked via the archetypal images. In narrative terms, for example, this is formed by the myth. Over shorter time periods the 'archetypal mimicking value' oscillates around the expected archetypal value, depending on the symbolic meaning represented in the archetypal image, as well as the oscillations of other archetypes. Buyers (sellers) buy (sell) something emotionally and justify it logically. The archetypal image, the core meaning of what was bought or sold, attracts the emotions which cluster around it. In times of excessive emotional imbalances, usually justified via confabulation, the initial symbolic meaning of the archetypal image (which at the start of its emergence was closely representing the expected archetypal value) gets so distorted by emotional exuberance around it that it leads the unconscious to compensate. The motivation of the collective unconscious to compensate is the risk embedded in the convergence of emotions around singular themes, i.e. single-mindedness, exemplified in crowded trades (see Chapter 7). It compensates by intersubjectively increasing the (perceived) value of neglected archetypes via the emergence of their respective images. In other words, like a healthy market, the collective unconscious operates at the global level where it dynamically rebalances, like a reversal to the mean, the rewards for exposures to factors, in this case emotional themes captured via archetypal images. Consequently, and similar to the sensitivity of a portfolio to a risk factor, the raw 'score' of an emotion embeds its sensitivity to an archetype. The second element in this psychic regression equation, which I call the Archetypal Equation, is the meaning which the archetypal image represents, i.e. its current risk premium. Jung called this the emotional charge or feeling tone of the archetype. Overall, the ultimate value or affect of an emotion is dependent on its sensitivity multiplied by the underlying emotional charge of the archetypal image, similar to the valuation of the marginal return contribution by a risk factor in the APT. Therefore, if the meaning of the archetypal image is changing, due to the compensating actions of the collective unconscious, the value of the emotion, i.e. its desirability in terms of fitness to a situation, changes too. It explains the wide swings in emotions, particularly in collective settings during turbulent times when symbols, both numerical and narrative, are created and destroyed at a rapid pace.

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<sup>185</sup> This note delves further into the similarities between risk factors and archetypes. It should particularly appeal to those familiar with (BARRA-type) risk factor models.

Finally, to a large extent emotions seem 'managed'. That is to say, the mandates for most portfolios are discretionary in the sense that they get consciously interpreted via deliberation, i.e. determining the specific buy and sell orders. However, there are a number of portfolios which remain non-discretionary. They are true black boxes. These portfolios, although part of the mind's 'stable of funds', are created non-consciously via program trades which get triggered autonomously. Sometimes they get triggered in order to form an overlay to balance an overly biased view of one of the other discretionary portfolios. In any case, all portfolios aim to match the appropriate internal state to the external environment by dynamically rebalancing the sector-specific psychurities. Still, 'appropriate' is eventually reflecting the individual's complexes via the biases in the discretionary portfolios.

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### 9.3.2 COMPARED TO OPTIMISATION

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A regression is an example of a method to optimise. Optimisation is a mathematical practice frequently applied in trading strategies and portfolio management. I believe it offers us a powerful analogy to further clarify the meaning of archetypes, as well as Jung's concept of the transcendent function.

The aim of optimisation is to find an optimal solution to a constraint problem, often in terms of finding a minimum or maximum value from within an allowed set. In investing, for example, practitioners optimise the weights of the holdings in their portfolio to achieve the minimum level of expected risk or, alternatively, the maximum level of expected return. The optimisation problem should be viewed in a larger framework, usually called a system. Within such a system, we can identify objective functions, search spaces, domains, constraints, equalities, and inequalities, among others.

So let's apply this to the archetypal hypothesis. We can interpret the collective unconscious as a mental optimisation system. Specifically, archetypes form the 'objective' or 'cost' functions which generate values to be modelled. These values come from within the domain of each particular archetype, its complex at the

personal level, and are “feeling values” or the “emotional charges” in Jung’s terms. They appear as images, or symbols, and in our optimisation analogy are the so-called ‘feasible solutions’. However, only those symbols that bridge (i.e. minimise the distance between) the conscious to the unconscious are optimal solutions. In Jung’s terms they are the “living” symbols that will perform the transcendent function by “putting an end to the division and forcing the energy of the opposites into a common channel” (CW6, para. 827), or factor if you will. Specifically, the collective unconscious attempts to fit consciousness to the model represented by the archetypes by selecting contents “best suited to themselves” (CW5, para. 232). Again, I have called this model the Archetypal Equation. In other words, the aim of the collective unconscious is to minimise the deviations between the two, or alternatively to maximise convergence. The difference between traditional mathematical optimisation and psychological optimisation comes from the fact that it is the unconscious, mandated to the archetypes, which drives this convergence (e.g. via enantiodromia) within the optimisation process as well as provide its objective, or goal, in the form of a symbol. At the individual level such optimisation ultimately comprises individuation, i.e. the transcendent function, and concerns the Self. As Robertson (1995, p.212) explains, the Self “is both process and goal. This is quite a paradox and paradoxes are usually not welcome, but this paradox is not the result of some metaphysical speculation, but a simple description of how symbolic resolutions emerge.” In finance we are familiar with such a paradox: you can only hope to receive a return if you accept the risk. And that moment occurs when you trade, with the price as symbolic resolution.

We can translate the optimisation process from mathematical terms into psychological terms for the individual investor:

- Overall, the optimisation process is Jung's individuation.
- The domain for each of the objective functions is personal, namely the individual's complex. For an investor this means his personal relationship to the symbol, the archetypal image, of an investment theme, a stock, or ultimately the price.<sup>186</sup>
- The solution to each of the objective functions is always local, i.e. the 'true' value of the symbol for the investor whereby the price triggers a trade.
- The ego-consciousness is the most obvious limitation, or constraint.

The translation in terms of the collective, i.e. for the financial system, follows the description of the metaphorical regression of section 9.3.1. Specifically, for an individual market:

- Overall, the optimisation process is wholeness (a balanced allocation across emotions).
- The domain for each of the objective functions is universal, namely the market's complex, specifically the relationship between the quantitative and the qualitative characteristics of its prices.
- The solution to each of the objective functions is global, i.e. the 'true' value of the symbol.
- Herd consciousness, a single-mindedness to the point of "irrational exuberance" reflected in crowded trades, is the most obvious limitation, or constraint.

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<sup>186</sup> That relationship exceeds a monetary commitment and more broadly extends to the investor's overall relationship to the market.



## 9.4 ADAPTIVE PURPOSE

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With these analogies it hopefully becomes much clearer what the archetypal hypothesis contributes to our understanding of the (market/investors) psyche. It is simply for the same reason the APT helps us, in an analytical sense, to model the capital market. Understood in this functional (e.g. regression) framework, combined with comments from previous chapters (in particular Chapter 2), it explains what the use of archetypes is for the human mind. Specifically, the adaptive purpose of archetypes in terms of increasing the emotional fitness is now clear. Like the elusive risk factors in the APT, subconsciously the archetypes:

- drastically reduce the number of input variables to make forecasts (Jung's "prognosticate"), i.e. to prepare an emotional response (e.g. behaviour) to an emerging pattern (i.e. situation);
- provide an evaluation in the form of an estimate for 'expected' response, helpful as a benchmark;
- allow a separation of systematic response (i.e. uniform instincts) and idiosyncratic response (i.e. personal complexes);
- provide a framework to assess exposures to emotional themes (e.g. irrational exuberance).

Clearly, the archetypes operate at the unconscious level and the comparison with the regression based CAPM and APT is only meant in a metaphorical sense. Still, I believe the interpretation of the archetypal hypothesis in terms of its adaptive

purpose agrees, for example, with the Effort-Reduction Framework proposed by Anuj K. Shah and Daniel M. Oppenheimer (2008).

To summarise, my investment framework of emotions, based on Jung's archetypal hypothesis, is metaphorically comparable to the combined CAPM and APT models for assets. Simultaneously I have also placed Jung's statement (1.1.4) on the unconscious in the proper context: the collective unconscious as the emotional equivalent of the market portfolio must indeed be an "incomparable prognosticator". Its role is to provide, via the archetypes, the implicit mandates for the strategic emotion allocation across all minds which include constraints for any tactical biases within emotion portfolios of individuals or crowds. These allocations revolve around eternal emotional themes, the myths and fairy tales surrounding "the rhythm of growth, flowering and decay" so clearly reflected (e.g. in booms and busts) in the capital markets. Again, that does not mean that the unconscious, nor by extension the market, is flawless.

#### ***Investment Note***

But how should we interpret this in terms of "measuring" emotional factors in markets? Let me again point out that in principle all traditional methods of investment research are analytical and only measure the quantitative dimension. These forms of analysis operate at the cognitive level, whereby investors either remain unaware of any biases, or these biases are 'explained away' via confabulation, e.g. in the form of a model. The other dimension of investment insights concerns intuitions, where the phenomenal 'head of the Ouroboros' bites the unconscious 'tail' to immediately 'get it'. As stated previously, Archetypal Valuation is about this qualitative meaning of price patterns, i.e. to feel the emotional charge of investment themes. This can only be experienced, not analysed. To put this into practical tools, including a proposed experiment is what Chapter 10 is all about.

Personally I therefore do not believe that the application of any quantitative analytical method on archetypes is useful. Nevertheless, for those who want to explore this, one can imagine a very rudimentary approach which would progress along the following lines:

1. Identify the symbols in the market which could represent Jung's traditional archetypes like the Shadow, the Self, and the Anima/Animus. It should be fairly easy

to identify for any (historic) period manifestations, like themes or people, which symbolise these archetypes. For example, for the internet bubble many would identify Alan Greenspan as symbolic for the Self (or Hero) whereas he has turned into the Shadow (or Trickster) in the credit crunch. The symbols identified in this way represent the archetypes, i.e. they form the archetypal images. Let's call them emotional investment themes or factors.

2. Next, one could use media services like Factiva, Google Insights, or Twitter to quantify the popularity of these emotional factors. In other words, the frequency of occurrence, multiplied by the tone (positive/negative) would result in the quantified 'meaning' of the archetypal image, a synthetic feeling-tone of the archetype.

3. Running a regression of the returns, or changes in asset prices, against the (changes in) these meanings would produce the sensitivity (or beta) to those themes.

In mathematical terms, according to this rudimentary analytical approach, the unconscious evaluates the collective emotions according to an equation which explains the variance in returns ( $R_i$ ) along various themes. It roughly has the following format:

$$R_i = \alpha + \beta_1 * \text{Theme1} + \beta_2 * \text{Theme2} + \beta_3 * \text{Theme3}, \text{ etc.}$$

After writing this note in early drafts of this thesis, Hageback (2014) published his book about, what I suspect is, a similar approach on this particular aspect.

## 9.5 EVALUATION OF EMOTION PORTFOLIOS

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According to the view described in the previous sections, the expression of an emotion is reflecting the weighted value of a portfolio of psychurities. That expression is dynamic in the sense that the portfolio is dynamically rebalanced in order to benefit from/hedge against an (emerging) situation, thus reflecting fluctuating values. Rebalancing involves quantitative, or rational deliberations, as well as qualitative, or pre-rational, affects.

### 9.5.1 QUANTITATIVE EVALUATION

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Quantitative evaluation involves planning or “syntactic operations” (Rolls, 2007), in short it manipulates symbols. This takes place in the linguistic centre which is part of a larger higher-order-thought system (HOTs, or Rolls’ ‘conscious processor’) located in the cortical area of the brain. It enables conscious reflections on emotions. The linguistic centre tries to quantify emotions, including those expressed by other minds, by modelling their sensitivities, their fitness, to an emerging situation. However, like the CAPM in finance, its main assumption is rational behaviour. The implication of this assumption is, in simple terms, that the variables are assumed to be linear and lead to stable relationships. To interpret this in terms of our metaphor of running a regression of emotions versus a similar historic situation, the linguistic centre uses an ordinary linear equation for its model. In this process of symbol manipulation it translates, as it were, the pre-rational representations into rational predictors of future behaviour. In fact, Rolls argues that in order to avoid inconsistencies in behaviour, the conscious processor has to have the belief that it is in control, even if it is an illusion:

This belief held by the system may partly underlie the feeling of free will. At other times, when other brain modules are initiating actions (in the implicit systems [PS: the unconscious]), the conscious processor (the explicit system) may confabulate and believe that it caused the action, or at least give an account (possibly wrong) of why the action was initiated. The fact that the conscious processor may have the belief even in these circumstances that it initiated the action may arise as a property of it being inconsistent for a system which can take overall control using conscious . . . processing to believe that it was overridden by another system. (2007, p. 410)

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### 9.5.2 QUALITATIVE EVALUATION

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The qualitative dimension of the evaluation, on the other hand, involves the semantic representations, or symbols, themselves and is performed by the non-analytical capabilities of the mind. As Jung reminds us the archetypes are, so to

speak, organs of the pre-rational psyche. Nevertheless, its end result, the qualitative meaning of the archetypal image, emerges in consciousness as Jung's emotional charge or feeling-tone, and subsequently influences the value of the emotion. This value is felt which, if rationalised, becomes a confabulation: the story to explain the emotional response. In the words of Jawaharlal Nehru "a man of action in a crisis almost always acts subconsciously and then thinks of the reasons for his action." This emotional charge consists, firstly, of its symbolic impact due to the shared meaning recognised ('appraised') by all agents in the 'emotions market'. For example, in the capital markets emotions are collectively expressed via price patterns. Each pattern is symbolic for the behaviour of a fictional composite investor (e.g. Mr Market) which, once subliminally recognised, triggers the mirror neurons. This part of the emotional value is most uniform or non-personal because physically the evaluation follows the same path, culminating in Gallese's "same body state". It goes through the limbic system, containing the more archaic parts of the human brain, specifically the amygdale, which particularly deal with the most uniform emotions, i.e. the instincts. Secondly, the charge includes a personal impact in that it has subjective meaning. The evaluation at the individual's level is influenced by the subjective perception of a pattern, biased by the accumulation of previous personal experiences concerning similar patterns.

In short, the perceived image of a situation emerges as a result of the interactions between and integration of the various subcomponents of the mind. This emerging:

- Is embodied by way of an expressed emotion which reflects:
  - a quantitative value according to a deliberate appraisal via cognitive processing: depending on the source of the emotion, the appraisal can be a confabulation;

- a qualitative value according to an archetypal appraisal via affective processing: it is autonomous by the subjective complex as well as the objective archetype;
- Is dominated by the influence of the unconscious: “The struggle between rapid unconscious pattern-detection processes and their slow, effortful modulation by deliberation is not a fair contest: so automatic impressions will influence behavior much of the time.” (Camerer et al., 2005, p. 21)

Let me introduce the following table which encapsulates what was just discussed:

<b>The securities market:</b>	<b>The psychurities market:</b>
Demand and supply of securities	Demand and supply of psychurities
Allocation (via competition and cooperation) of monetary resources	Allocation (via competition and cooperation) of mental resources
Securities allow adaptation to economic situations	Psychurities allow adaptation to ecological situations
A security has a monetary risk/return profile	A psychurity has a mental risk/return profile
Securities form investment portfolios	Psychurities form emotion portfolios
Value reflects economic utility	Value reflects emotional utility
Value embeds historic fitness to previous monetary conditions	Value embeds historic fitness to previous mental conditions
Investment analyses are quantitative evaluations. They explain value.	Investment intuitions are qualitative evaluations. They feel value.

Viewed from this perspective, evaluation consists of a quantitative and a qualitative dimension. Price discovery is the intersubjective process followed by these evaluations, whereby the collective unconscious compensates any excess reliance on either dimension via increasing/decreasing the risk premiums to underexposed/overexposed emotional themes. In Jung’s words:

The activity of consciousness is selective. Selection demands direction. But direction *requires the exclusion of everything irrelevant*. This is bound to make the conscious orientation one-sided. The contents that are excluded and inhibited by the chosen

direction sink into the unconscious, where they form a counterweight to the conscious orientation. The strengthening of this counterposition keeps pace with the increase of conscious one-sidedness until finally . . . the repressed unconscious contents break through in the form of . . . spontaneous images . . . As a rule, the unconscious compensation does not run counter to consciousness, but is rather a balancing or supplementing of the conscious orientation. . . . the unconscious supplies all those contents that are constellated by the conscious situation but are inhibited by conscious selection, although a knowledge of them would be indispensable for complete adaptation. (Jung, CW 6, para. 694)

#### **Jungian note**

Constellations of multi-layered emotion portfolios can form complexes around themes reflecting risk and return. The exposure to the theme (i.e. the correlation of the value of the emotion with the theme) reflects the extent of the imbalance, and thus the risk. Others have previously argued that the limbic system plays a crucial physical role in the emergence of archetypal images (e.g. emotions). I would add that dopamine can be the physical 'currency' of exchanging Jung's emotional charge in the neural system.

## 9.6 CONCLUSION

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The above makes clear that the value of an emotion, Jung's "emotional charge", is the result of a subliminal evaluation to recognise patterns: situations are assessed in order to deploy the most efficient portfolio of sector-specific psychurities for the confronting situation. I argue that this evaluation of emotions, particularly instinctive emotions, originates at the unconscious level with archetypes acting as systematic subliminal regressors, or emotional factors, because:

- Emotions proceed along a path that is similar for all healthy adult humans. Specifically, emotions are uniformly mapped because the statistical structure

of ancestral situations, e.g. their distribution of historic occurrences, and their relationship with the evolved specialised psychological functions is the same in every human. Translated in terms of portfolio management, this means, for example, that per situation the portfolios for different individuals will contain similar psychurities. The extent of similarity between the portfolios depends on the common value, or shared meaning, of the confronting situation. In Jungian terms, some events and symbols reflect more uniform meaning than others. They broadly evoke the same emotional response and thus lead to more instinctive responses. This manifests itself most clearly, for example, when individual consciousness is subsumed by crowd consciousness which simultaneously allows an emotional escape valve from personal complexes (see Chapter 7).

- It involves competition for emotional capital. This capital is allocated by the unconscious across emotions according to the (expected) value of the respective emotion depending on the archetypal sensitivities. This value embeds an historic correlate, an expected fit to situations and events based on previous experiences which created the emotion as an evolved strategy. Ultimately the emotional charge of the archetypal image reflects the meaning of those experiences (internally) and correspondent events (externally) and is contained in a symbol. In Jungian terms, the goodness of fit between the emotional charge or archetypal expectancy embedded in the symbol and the real experience is the cause of the re-evaluation of emotions, and thus by extension the dynamic rebalancing of the portfolios.
- Requires a non-conceptual numerical template to enable the numerical operations involved, in particular counting, scaling and trigger setting, as well



as to translate various emotional exchange rates into a “common (neural) currency” (e.g. Rolls, 2007; Levy and Glimcher, 2012). Emotions deal with a large variety of psychurities, reflecting the immense arsenal of stimuli. Their resulting values not only need to be ‘expressed’ in a common currency in order to make ‘fair’ comparisons possible, i.e. benchmarking, but also in the right ‘dose’ to trigger a bodily response.

- The numerical archetypes form this template. Although they remain unconscious, as part of their function they offer the most powerful symbols due to the fact that numerical symbols by their very nature, i.e. in their appearance, reflect the quantitative aspect of any emotional value immediately. In that respect, these symbols provide the most objective form of communication, a non-verbal language. It is most objective because, compared to words for example, numbers express undisputedly this aspect of reality and consequently directly focuses individual consciousness. On the other hand, the qualitative aspect remains hidden and its tension with the quantitative aspect is the cause of the change in emotional charge, i.e. the dynamics in emotional values. For example, the names Google and Amazon are considered symbols for the internet. Although we could endlessly debate whether Google is a better symbolic internet company compared to Amazon, if Google is quoted at, say, \$200 compared to \$100 for Amazon, we all agree that we need to pay more for a Google share. That’s the reality. But this quantitative aspect has a qualitative flipside and the tension between the two leads to even more heated debates, i.e. “is Google worth \$200?” In other words, the meaning of numeric symbols in terms of their emotional impact, is

more concentrated than names, slogans or logos. Their dominating impact manifests itself:

- on individual consciousness via numerical intuition,
- and on collective consciousness via participation mystique triggered cerebrally by mirror neurons.

If Archetypal Valuation is aimed at inclusion of the archetypal impulses into investment research, archetypal meaning is what this approach is trying to reveal. Specifically, by projecting market data in a format that appeals to those psychological functions associated with the unconscious, e.g. intuition, the revelation of unconscious contents of the market mind is facilitated.

Jung made a few (implicit) references to archetypal meaning. The following quote is indicative of what he meant:

It always seems to us as if meaning—compared with life—were the younger event, because we assume, with some justification, that we assign it of ourselves, and because we believe, equally rightly no doubt, that the great world can get along without being interpreted. But how do we assign meaning? From what source, in the last analysis, do we derive meaning? The forms we use for assigning meaning are historical categories that reach back into the mists of time—a fact we do not take sufficiently into account. Interpretations make use of certain *linguistic matrices that are themselves derived from primordial images*. From whatever side we approach this question, everywhere we find ourselves confronted with the history of . . . images and motifs that lead straight back to the primitive wonder-world. (CW9i, para. 67; emphasis mine)

What this means in practical terms is discussed in the next chapter, chapter 10.

## CHAPTER 10. AVIR, OR THE MARKET SPEAKS ITS MIND: A PROPOSAL FOR AN AUDIOVISUAL EXPERIMENT

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*Reason is the organ of truth, but imagination is the organ of meaning.*

*C. S. Lewis, Mere Christianity*

*If one really wishes to be a master of an art, technical knowledge of it is not enough. One has to transcend technique so that the art becomes an "artless art" growing out of the unconscious.*

*D.T. Suzuki, Zen Buddhism*

*I need to know what is happening in the markets . . . I hooked up a music synthesizer to the computer, linked it to the interface between the computer and quote screen, and generated a program that would give a musical summary of the markets. I used piano tones for stocks, strings for interest rates, the cello for short-term rates, and the violin for the 30-year bond. The Japanese yen was registered with the high flute, corresponding to the favorite instrument in Japan, the shakuhachi. The English horn, the French horn, and the Alpenhorn stood in for the other currencies.*

*Victor Niederhoffer, The Education of a Speculator*

### 10.1 INTRODUCTION

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This chapter describes a skeletal framework for future (follow-up) empirical research. It is one way in which the ideas developed in this thesis might be taken forward. It contains a suggestion or proposal for an experiment (10.7) that would test a few of the (implied) sub-hypothesis of my thesis. It centres on Audio Visual

Investment Research (AVIR), a new investment research method<sup>187</sup> I am developing which puts the theoretical concepts discussed in this thesis into practise. Overall, successful tests would support that AVIR could improve the investment performance of subjects according to the test criteria. In other words, such an outcome would not only support the theoretical sub-hypotheses of my thesis but would also suggest AVIR as complementary to existing investment analysis (e.g. fundamental, quantitative, etc.)

Ultimately AVIR's central aim is twofold. First, help investors make better investment decisions (however, as I will explain below, it is likely that not everybody will benefit from AVIR equally.) Second, by providing a complementary, more contemplative, method of research AVIR can compensate for the current overreliance on, including overconfidence in, quantitative investment analysis, thereby possibly contributing to a healthier, more balanced market mind.

I would hope that I will, in due time, be able to set-up and complete the experiment myself (perhaps in combination with other [extended] tests). In the meantime I hope this proposal clarifies what I have in mind (and may perhaps inspire somebody else to perform it.)

Before discussing AVIR from section 4 onwards, I will provide a brief recap, respectively some background in the next two sections.

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<sup>187</sup> In the following, AVIR refers to the combination of method (i.e. active imagination) and the software tools used for this purpose. On previous occasions I have also referred to it as Market Audio Visualization (MAV). The software is in a preliminary stage and has not been fully developed yet. Earlier market sonification software tools include Sonify!, Accenture and Sandbox, but all have either ceased to exist or have a stale version. None have made the connection to advanced visualisation.

## 10.2 RECAP

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As discussed in the previous chapters, my thesis suggests that the market manifests mentality, i.e. collective consciousness. Like any conscious entity it expresses a broad range of behaviours, varying from rational to emotional. We are particularly interested in those mental categories that originate in the unconscious and/or culminate in the phenomenal domain. Why? Because both are irreducible to cognitive functions, escape axiomatic capture and thus make traditional investment analysis methods inappropriate. The prime example of such a category is mood.

There are three important points to repeat and further clarify here:

- 1) The U.S. sociologist Robert E. Park coined the term collective behaviour, and defined it as “the behavior of individuals under the influence of an impulse that is common and collective, an impulse, in other words, that is the result of social interaction.” Like Park, Jung also emphasised that it is the collective aspect that leads to this impulse. In his case the impulse originates from the shared archetypes of the collective unconscious whereby the numerical archetypes are primary and of particular relevance for market behaviour. Translated in terms of AMH, market behaviour is the composite behaviour of market participants under the (subliminal) influence of prices that are the result of price discovery by way of exchanges (i.e. trades). This makes the process reflexive: prices impact the behaviour that results in prices. They instigate while simultaneously capturing those behaviours in a concentrated, namely numerical, form.

- 2) Some of these behaviours, including embedded nuances and intentions, are not always picked up consciously by the participants (let alone observers, for that matter). Specifically, market data can contain patterns which are non-random and have archetypal meaning. That is to say, patterns can at a subliminal level reveal information about the more primordial expressions of the mentality of a market state, e.g. emotions. As I have argued before, echoing Jung, archetypal meaning originates in the unconscious and is understood in the archetypal experience. The latter is important: market data, either recorded or live, needs streaming to convey such meaning. As far as discovery is concerned, it culminates in the phenomenal sphere as an internal surprise, an Eureka moment or "A-Ha Erlebnis". It is an insight, a creative breakthrough, as distinct from any cognitive deliberations about the market state that take place in analysis.
- 3) Archetypal meaning escapes axiomatic capture and is not perceived in an analytical sense (e.g. captured in a regression in Excel). More broadly, Jung argued that primordial expressions are uniform across cultures and generations and therefore instantly recognised at the subliminal level. They particularly occur, for example, in forms of art because art is the epitome of such communication. This is one reason, for example, that Jung looked at art and other creative expressions of myths. The ability of art to convey meaning depends on the objectivity of the symbolism used, thus underlining the power of numbers and their relationships as they are the ultimate objective symbols. An obvious example of this power is the use of the golden ratio in architecture, music, paintings, etc. Above all, comprehension of archetypal meaning adds to experiential knowledge, gained through a qualitative

intuition rather than a quantitative analysis. In our case this is conveyed when market patterns are experienced dynamically with 'live' prices (i.e. for historic time series this means bringing prices back 'alive' by streaming them.)

In short, to comprehend the market's full state we deal, first, with prices as the symbolic expressions of its mind. Being numbers they are the most objective symbols available for shared meaning across cultures and generations. Second, we focus on the qualitative aspects of these symbols via an

intuitive technique for grasping the total situation . . . For obvious reasons, a cognitive operation of this kind is impossible . . . Judgment must therefore rely much more on the *irrational functions of consciousness*, that is on sensation (the "sens du réel") and intuition (perception by means of subliminal contents") (Jung, 1955, p. 49; emphasis mine).

It is clear, first, that this interpretation of market dynamics is a far cry from the random patterns which EMH advocates. It is also clear that both the method and the tools with which we traditionally research markets are inadequate to reveal archetypal meaning in a format that appeals to the psychological functions associated with such understanding. Therefore I will also explain in this chapter which method and which type of tools could be used to achieve this: appeal to intuition and other System 1 abilities to reveal the market's unconscious contents, its subliminal messages, as well as its phenomenally manifested mood. To distinguish it from analysis I will occasionally use the term synthesis for this. Again, just to be clear, such undertaking should be viewed as complementary, not contrary, to analytical methods of investment research.

Perhaps unusual for a chapter on a proposal for an experiment, I regularly quote various experts because, as discussed, I have no empirical proof yet for my

proposal. All I can do at this stage is to use these quotes to weave my arguments together. They support and clarify my thinking and motivation concerning the investment research method I am developing as well as the proposed experiment to test it.

So, how to get “in sync” (see 5.4) with the market’s rhythm? How to sense its emotional excitement? These questions need to be answered both from a theoretical perspective, as well as from a practical one. Specifically, what are the theoretical arguments that the market’s rhythmical movements are ‘like’ music? Ciardi (2004, p. 1), for example, argued that there are at least two reasons to explore the musical potentiality of stock market information sonification. First, as the rate of stock prices is often sharp and unexpected, unforeseeable sonic results might occur in the sonification of stock data. Second, the inner and subtle correlation of stock price variations may be considered similar to the correlation of patterns within a musical composition of stock market environments, in which large numbers of changing variables and/or temporarily complex information must be monitored simultaneously, are well suited for perceptual research in sonification. Also, a number of well-known traders have made comparisons between markets and music (e.g. Schwager, 1992; Niederhofer, 1997). Finally, by sonification of prices and exposing them to the resulting sounds Marcovici trained rats to trade forex and commodity futures.<sup>188</sup>

Next, what tools are required to mediate this in a proper format, that is to say a format that improves the investor’s understanding of market movements? Although ultimately price qualia (like all qualia) are experienced from a first person

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<sup>188</sup> Although his motivation was different, i.e. whether rats can replace human traders. Michael Marcovici, “Rat trader”; *Art and Economy*; Institut für Kunst im Kontext, Berlin, September 2014, pp. 52-59.



perspective only by those who have 'skin in the game' and reflexively act on these, extreme adherence to this would limit the opportunities to enhance our understanding of markets too much. Instead, to recognise the market as a collective animated entity and to appropriately interpret its communication accordingly is the message that this chapter is trying to bring across, also aimed at other researchers<sup>189</sup> of markets.

I'd like to use a quote from Damasio, which I freely interpreted by replacing his "(living) organism" and "biological systems" with "market", respectively "assets":

The miniconcert of fear is ready to be played whenever the situation demands it . . . It may be helpful to think of the behaviour of [a market] as the performance of an orchestral piece whose score is being invented as it goes along. Just as the music you hear is the result of many groups of instruments playing together in time, the behaviour of [a market] is the result of several [assets] performing concurrently. The different groups of instruments produce different kinds of sound and execute different melodies. They may play continuously throughout a piece or be absent at times, sometimes for a number of measures. Likewise for the behavior of [a market]. Some [assets] produce behaviors that are present continuously, while others produce behaviors that may or may not be present at a given time. The principal ideas I wish to highlight here are: First, that the behavior we observe in [a market] is not the result of one simple melodic line but rather the result of a concurrence of melodic lines at each time unit you select for the observation. Second, that some components of behaviour are always present, forming the continuous base of the performance while others are present only during certain periods of the performance; the "behavioral score" would note the entrance of a certain behavior at a certain measure and the end of it some measures later. . . Third, that in spite of various components, the behavioral product of each moment is an integrated whole, a fusion of contributions not unlike the polyphonic fusion of an orchestral performance . . . something emerges that is not specified in any of the parts. (1999, pp. 87-88)

In answering the question of how to sync with markets we can be more specific if we judge them to be animated entities:

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<sup>189</sup> Again, with the third-person caveat.

The answer, oddly enough, can be found in music . . . The melding of sight and sound generates a powerful set of memories . . . Lives are conducted to a musical score, proceeding to *a beat and a rhythm that operate below usual human awareness. Music provides the moods*, the emotional texture . . . In music, a pivot chord is one that contains elements of several different keys, providing a natural transition to a new key. The point at which the pivot chord is struck is one of maximum ambiguity, as the score could proceed in any of several directions. Composers often sustain a sense of anticipation and drama by prolonging pivot chords, creating a build-up of tension to be released in the subsequent key shift. . . . *mood will swamp any message* that is offered. The first step, then, is to achieve a mood shift. That is the purpose of the pivot chord. . . . Evoke an enhanced state, and a pivot becomes possible—a new melody, a new rhythm. . . . people will process information more deeply and more enduringly when they are in such enhanced states. . . . in routine states of mind, people can only see things in routine ways and behave according to routine. It is when they shift their musical scores that they become able to process even the thorniest emotional patterns in new and constructive ways. (Steenbarger, 2003, pp. 35, 36, 39; emphasis mine)<sup>190</sup>

The topic of “pivot chord” is echoed by trader Howard Abell as he reflects on his transition from floor to screen trader:

sights and sounds, more importantly, lead to your feelings . . . I rely on my intuition. As the market moves and I watch the screen, I monitor my own feelings and mental images. With each price movement, I can see and hear and feel what’s going on as if I were still on the floor. I can literally hear the sound of the ticks being made on that screen. I can visualize . . . Based on all those sights and sounds and intuitions, if you will, I decide where to enter and exit the market. . . . When you’re sitting in front of a screen, if you think about it, you can see and feel the climax that takes place, which is to say, the sudden cessation of emotionality in the market. You can “feel” that the market is at a turning point. (Koppel, 1996, p. 150)

Others need more help with such imagination which is where AVIR comes in. But first some background.

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<sup>190</sup> Brett Steenbarger is a professor of psychiatry and behavioural sciences and an active trader. He also counsels other traders on trading psychology.

### 10.3 BACKGROUND

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Earlier I stated that the premise of the market as a mind-body not only throws up thorny philosophical issues but also practical challenges. The latter concerns the research methods with which we could approach the elusive sensations that complete market states. Current practise prefers not to deal with this phenomenal overlay of market conditions. Specifically, market moods escape the cognitive domain in the sense that they are not contained in a representational cognitive format (in contrast to, for example, memories). Consequently, they do not become available to cognitive functions like reasoning and thinking. It is ironic that the great minds of physics became comfortable with Bohr's complementarity, originally inspired by James' mental concept of it, but that the mind sciences seem allergic to such interpretations by labelling them as another form of dualism. As I have argued throughout, the mind sciences could live with the mind-body problem but it requires their own quantum leap by becoming comfortable with complementarity and collectivity. It is particularly helpful in dealing with the shared reality of intersubjectivity, i.e. the collective experience of mind, which is an irreducible part of any individual subjective experience. Crucially, complementarity suggests that, like its physical cousins (i.e. the particle and the wave), the cognitive and the phenomenal have a shared origin, in this case the unconscious, but manifest differently and require complementary 'readings of the mind'.

What does this mean, for example, in terms of EMH which argues that prices contain all information? The question we should ask is whether the *analysis* of prices

transmits all this information. This reminds one of Einstein's famous sign<sup>191</sup> in his Princeton office which is very much in the spirit of Jung's thinking. Ignoring the unconscious origin for now, the irreducibility of consciousness means that qualia are inclusive of experience but resist reduction to the cognitive domain. This implies that the qualia of prices cannot be reduced to the processes of the market. The latter are the focus of analysis via traditional methods of research. Those methods rely on representational content via access consciousness. They only reach part of the information, leading to *analytical* knowledge. But prices contain information over and above this. Specifically, their dynamics embed qualities of experiencing market states and we should harvest these to expand *experiential* knowledge.<sup>192</sup> They are the phenomenal realisation of the same information, i.e. the feeling of their discovery. We rely on them to notice Bateson's "difference that makes a difference", i.e. that it "counts".

The traditional view on how this phenomenal aspect could be appreciated and comprehended is from the first person perspective. Critics of a first person perspective will argue that it is not objective. Still, some have argued that, in studying consciousness, data that are accessible through first person methods should be put out for intersubjective validation (e.g. Blackmore, 2005, p. 224). Kahneman and Krueger, on subjective reporting of well-being, seem to agree:

the data are a valid subject for study in the sense that they capture at least some features of individuals' emotional states. . . . Acceptance of self-reported measures of well-being, subject to the many caveats that subjective measurement requires, could have a profound impact on economics. (2006, p.22)

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<sup>191</sup> "Not everything which can be measured counts, and not everything that counts can be measured".

<sup>192</sup> One approach in that vein, based on Soros' reflexivity, has been developed by Flavia Cymbalista and is called market focusing. See References section.

However, the difference with the traditional first person perspective is that the phenomenal in the case of markets extends to intersubjectivity. The intersubjective nature of market states provides a second person perspective that dominates (i.e. frequently overwhelms) the first person perspective. Within the broader consciousness debate this makes prices so valuable as a data source: they are empirical data not only of the underlying physical assets but also of shared experiences in dealing with those assets when people engage in exchanges. Prices, in other words, provide objective testable evidence for intersubjectivity, the phenomenal essence of the market's mind. As we saw earlier, they are "the means" that Jung's associate, von Franz, had been looking for.

However, to uncover these qualitative patterns requires a different methodology and there clearly is no tradition in finance for researching market states from this perspective. AVIR attempts to fill this gap.

## 10.4 AVIR

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In the following quote the neurologist Oliver Sacks points to a phenomenon that is at the heart of AVIR:

The almost irresistible power of rhythm is evident . . . Rhythm and its entrainment of movement (and often emotion), its power to "move" people, in both senses of the word, may well have had a crucial cultural and *economic function* in human evolution, bringing people together, producing a sense of collectivity and community. (Sacks, 2007, p. 246; emphasis mine)

This has been researched thoroughly and widely (see, for example, Kelso as quoted in 7.4). In fact, the historic roots of AVIR start in the 1970's. Richard Voss, who worked with Benoit Mandelbrot at IBM's Thomas J. Watson Research Centre, may

well have been the first to experiment with sonification of financial time series, in his case IBM stock prices. Voss also played a seminal role in the visualisation of fractal patterns in music. Other sonifications (some in combination with visualisation) included sonification-mapping, sonification to support trading, and multi-modal sonification. In his bestseller, *The Education of a Speculator* (1997), Victor Niederhoffer spent a whole chapter on music and markets (e.g. see quote at start of this chapter).

AVIR takes this into a different and potentially more practical direction by combining sound and visuals, supported by recent insights in the mind sciences. It facilitates pattern recognition in market data by appealing to the mind's System 1 capabilities, but in a structured and disciplined way, using advanced software tools. If nothing else, it helps System 1 to compete more fairly against System 2 in any 'judgement contest' (e.g. Kahneman and Klein, 2009) on their competence to contribute to, for example, investment decision making. The creative dimension was recognised, for example by Ben-Tal and Berger:

Our line of work reveals interesting glimpses of creative processes. We propose that listening, in itself, is a creative process, in that, by identifying patterns and detecting trends, a meaningful mental image is elicited from a stream of air pressure changes. (2004, p. 5)

The importance of a balanced mind and allowing creativity was also acknowledged by trader Ed Seykota: ". . . if I didn't allow myself the freedom to discharge my creative side, it might build up to some kind of blowout. Striking a workable ecology seems to promote trading longevity, which is one key to success." (Schwager, 1993, p. 154)

We need to perceive this in the broader context of price discovery as the collective self-organising principle that orders the market's mind. In (Schotanus, submitted), I

state, among others, that crowds of investors are emotionally involved in this process and embody “affective expectations” (Jung, 1955, p. 36). It is in the sense of wholeness, namely the complementary affective or archetypal expectation within a “psychic probability” (Ibid, 138) that choices and judgements are made “for grasping the total situation” (Ibid, p. 49 as well as earlier quote), in our case grasping the full market state, in particular its mood.

By appealing to the “irrational functions” (Ibid) AVIR attempts to invoke the market’s mood. Also, it is generally agreed among mind scientists that qualia escape cognitive capture and cannot be represented in an axiomatic sense. Nevertheless, they form the culmination, an overlay if you will, of both unconscious and conscious expressions, and complete the mental state. At the collective level they tend to overwhelm any individual mentality and can lead to crowd psychology, extreme examples being exuberance, respectively despair. In short, mood is the most elusive property of market mentality and traditional analytical attempts to ‘measure’ it (e.g. put-call spread, bull/bear ratio, VIX Index, etc.) completely fail to convey its essence, namely how it feels like. Most traders realise this. In an interview with Active Trader Magazine<sup>193</sup>, for example, the following exchange took place:

**Interviewer:** So, to be clear, when you refer to sentiment, you’re not talking about data inputs such as Bullish Consensus, or put-call ratios, or similar data or indicators?

**Trader:** No, We don’t use any specific sentiment gauge or tool to track market sentiment. It’s more of a general feeling you get from trading a market and understanding the relevant dynamics.

Crucially, what seems to be missing is the ineffable sense of (rhythmical) ‘animation’, mediated primarily via moving prices, which is an intricate characteristic

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<sup>193</sup> “Ebullio Far East fund’s fundamental difference”. Active Trader Interview. Active Trader Magazine, April 2014, Volume 15, No. 4, pp. 44-49.

of the experiences associated with (swings in) market moods. This brings us to music.

Music is unique among the arts for numerous reasons, but for our purposes the following is of particular relevance:

- It allows large amounts of data to be efficiently combined (e.g. a song can be incredibly complex without sounding as such);
- it is dynamic and has duration;
- it has an aesthetic, specifically mathematical, order (e.g. fractal patterns);
- it facilitates anticipation<sup>194</sup>;
- and most importantly, it can express/instil/invoke emotions and feelings;

Allow me to let others provide additional arguments. First, Sacks:

We humans are a musical species no less than a linguistic one. This takes many different forms. All of us (with very few exceptions) can perceive music, perceive tones, timbre, pitch intervals, melodic contours, harmony, and (perhaps most elementally) rhythm. We integrate all of these and “construct” music in our minds using many different parts of the brain. And to this *largely unconscious structural appreciation* of music is *added an often intense and profound emotional reaction* to music . . . Much that occurs during the perception of music can also occur when music is “played in the mind.” The imagining of music, even in relatively nonmusical people, tends to be remarkably faithful not only to the tune and feeling of the original but to its pitch and tempo. Underlying this is the extraordinary tenacity of musical memory, so that much of what is heard during one’s early years may be “engraved” on the brain for the rest of one’s life. Our auditory systems, our nervous systems, are indeed exquisitely tuned for music. (2007, p. xii; emphasis mine)

Sacks is an expert on music therapy. Others have argued more broadly to use art forms in general, and music in particular, to broaden our scientific research of the

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<sup>194</sup> “[R]esearch has now shown that so called responses to rhythm actually precede the external beat. We anticipate the beat, we get rhythmic patterns as soon as we hear them, and we establish internal models or templates of them. These internal templates are astonishingly precise and stable; as Daniel Levitin and Perry Cook have shown, humans have very accurate memories for tempo and rhythm.” (Sacks, 2007, p. 240)



human psyche. Like Jung and Pauli before them, physicists David Bohm and David Peat, for example, have been reflecting on what makes the material and mental complementary, i.e. what coordinates a shared order. They discuss the implicate, explicate and generative (e.g. fractal) orders in their book *Science, Order and Creativity*. Of particular interest to us in light of the animated and temporal nature of experiencing price patterns, e.g. trends, is the following:

the implicate order can be experienced directly, not only in connection with the fluctuating background of consciousness but also in relationship to perception of certain kinds of well-defined forms. Consider, for example, how music is comprehended. At any given moment, a particular note may be sounding in awareness, but at the same time, a kind of "reverberation" of a number of earlier notes can also be sensed. Such reverberation is not the same as recollection or memory. Rather it is more like a part of an unbroken enfoldment and unfoldment of the notes concerned into ever subtler forms, including emotions and impulses to physical movement, as well as a kind of "ethereal" echo of the original notes within the mind . . . This suggests that, at any given moment, a number of notes are present in awareness in various degrees of enfoldment. The simultaneous awareness of all of these is what constitutes the sense of unbroken flow that has been described above. But this means that it is possible to be directly aware of an implicate order as a set of similar differences that are present simultaneously in different degrees of enfoldment of successive notes. (2000, pp. 187, 188)

AVIR aims to achieve the intuitive attunement of the individual mind to the market's mind by representing market data in the form of sound and visuals. In section 10.6 I will provide a link to a file that contains an example.

The contemplative method, consistent with mindfulness/mind walking research (see below) and the (e.g. relaxation) techniques it suggests, appeals to the non-analytical and creative capabilities of the mind. Its aim is to trigger the "enhanced state" to get "in sync" with the market by dynamically displaying market data, creating a multimedia experience of engagement with its mind:

a sense of total absorption in the market. In the "zone" conscious thought disappears and an ultimate sense of presence takes over . . . senses are heightened to the rhythms and sounds of the market and the flow of trades. Achieving oneness with the market can wipe away thoughts beyond the moment . . . Joshua Geller attributed the success of one of his traders to his musician's access to the rhythmic flow of the market; . . . "He sways with the market", Geller said. He followed the market cadence, switching his positions with the changing tempo of trading, moving his positions in and out with an improvisational technique. (Zaloom, 2006, p. 136)

For example, by transmitting as audiovisuals the mesmerising 'beats' of the market surrounding hypes we can achieve an effect similar to that of trance music. Although some users will be content to have others create such audiovisuals and to receive them as research material, the biggest impact will be for those users who get themselves involved and create their own audiovisuals. In short, the method, which will require training, may help investors to understand market dynamics at another level than the analytical. AVIR as a complementary research method potentially also opens the door for future investigations to explore whether the "new" investment analyst is closer to being a therapist in her interactions with the market, for example in the links between intuition, empathy (i.e. with Mr Market), and her own subjectivity. Finally, AVIR is also, I believe, consistent with Jung's intentions regarding active imagination (e.g. CW18, para. 396-397).

The additional visualisation further emphasises the qualitative characteristics of market moods as captured in the sound. Kathryn Coe's definition of visual art is appropriate in this context: "the modification of an object or body through color, line, pattern and form that is done solely to attract attention to that object or body" (2003, p. 76). The motivation for such multisensory display is to widen the computer-human bandwidth which is the amount of information—displayed by the computer—that users can perceive through their senses. This can be achieved by

mapping different data attributes to the different senses. (Nesbitt and Barass, 2004, p. 45).

In terms of tools, whereas we use Excel, Matlab, R, and similar software for our cognitive analysis until now we have had no such tools available for our intuitive synthesis. Part of the reason was the lack of a proper format with which to appeal to intuition. As I will show shortly, by identifying audiovisuals as such a potential format, appropriate tools also become available by extension. These consist of advanced data-converters, DAWs, respectively audiovisual software. First, however, I will discuss the methodology AVIR subscribes to.

## 10.5 METHODOLOGY

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Traditional research methodologies in finance vary from empirical, via experimental, to behavioural. Examples include statistical analysis (e.g. regressions) of time series, investment games in simulated markets, and investment questionnaires. What they have in common is the general objective of identifying whether or not the results show any anomalies to existing theories or confirm them. Moreover, although they may, for example, state that they test (the flaws in) System 1 capabilities, they all use tools and methods among subjects (including researchers themselves) that are tailored to and facilitate mental capabilities associated with System 2. If nothing else, this is unfair. In the context of this chapter, it's like testing a subject on her overall understanding of music by providing sheet music that allows an analytical interpretation but denying her an instrument for a sensual interpretation.

The new methodology I propose is, instead, aimed at stimulating and guiding subjects' intuition by using AVIR which provides support of System 1, similarly to what statistical analysis via Excel offers in support of System 2. Specifically, the aim of the proposal in section 10.7 is to see whether AVIR improves investment decision making. I propose a set-up for an empirical experiment to test some of my claims. Although different in set-up and purpose, it builds on previous research in:

- Market sonification, particularly by Janata and Childs (2004) as well as Worrall (2009).<sup>195</sup> The fact that sound has duration and can thus portray changes over time, that it can efficiently contain large amounts of different data sets, and that it dynamically conveys the underlying patterns and structure of that data are among the arguments used for sonification.<sup>196</sup>
- Market visualisation, particularly by Nesbitt and Barass (2004) as well as Hasanhodzic et al (2014).<sup>197</sup> Here the main argument centres on the way data is visually represented and how this can be improved by changing it, e.g. adding other visualisations of the same data.

Janata and Childs set up pilot projects to test a system for the sonification of real-time market data. Among others, their results "indicated a significant increase in accuracy when the auditory display was used". In his PhD-thesis Worrall introduced a new technique for the audification of securities market data by sonifying net market returns, specifically of the Australian stock index, which preserved the autocorrelation in the data that could be aurally detected.

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<sup>195</sup> Specifically, regarding tools for market sonification, see for example Ciardi (2009) and Van Ransbeeck and Guedes (2009).

<sup>196</sup> Here is an example of [market sonification](#).

<sup>197</sup> In the broader context of data visualisation they are in the spirit, for example, of Edward Tufte's work.

Hasanhodzic et al designed an experiment in the form of a video game, called ARORA. ARORA's aim is to test whether human subjects can differentiate between actual vs. randomised prices, both represented in temporal charts.<sup>198</sup> The motivation for their approach is to assess, among others, whether data represented in this format adds something to tabular representations. Overall they find statistical evidence that subjects can make that distinction.<sup>199</sup> They conclude that temporal charts of asset prices convey to investors information that cannot be reproduced by summary statistics. Their results contrast previous anecdotal evidence and they call for more research on the usefulness of making such representations available to investors.

Along similar lines, Nesbitt and Barass take the form of representation to the next level. Their goal was to develop a human perceptual tool by way of audiovisuals for traders to improve their ability to uncover trading patterns. Again, such audiovisual tools increase the computer-human bandwidth: the amount of data simultaneously transferred via the computer to the user's senses.

Guided by this research (which, in turn, contains references to related research) the motivation for the suggested empirical part of my thesis is as follows. First, compared to Hasanhodzic et al the proposed experiment does not focus on distinguishing real and synthetic/random data. Also, their temporal charts are used, for example, in technical analysis and thus still appeal primarily to System 2 cognitive abilities. Instead, my approach originates in the methodologies of Jung,

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<sup>198</sup> As an aside, their approach could also work for our purposes. For example, a simple laboratory experiment would be to test whether subjects can make a distinction between audiovisualisations of market data vs. those of random data. The aim is to prove that, at least under those controlled conditions, subjects can recognise the market as an entity which communicates in a purposeful (i.e. non-random) way.

<sup>199</sup> For an early (2010) critique of their research see, for example, [http://www.burns-stat.com/pages/Working/hypotheses\\_about\\_ARORA\\_financial\\_turing\\_test.pdf](http://www.burns-stat.com/pages/Working/hypotheses_about_ARORA_financial_turing_test.pdf). I've been informed in personal correspondence that some of these criticisms will be addressed in their forthcoming paper.

e.g. active imagination, and others which appeal to the non-analytical or intuitive capabilities of the human mind (i.e. System 1). Second, compared to Nesbitt and Barass, the format with which the data is transferred and transformed via AVIR is expected to not only add to the bandwidth but also improve the attunement to the subject's intuition. Specifically:

- 1) It is in the dynamics of prices and other market data where the qualities of rhythmical patterns are embedded and AVIR thus advocates streaming that data 'live' to convey the overall sense of rhythm. This is in contrast to the static graphs and tables used in analysis.
- 2) In order to appeal as much as possible to the primordial recognition capabilities in System 1, AVIR advocates creative forms of sounds and visuals. The emphasis is on the surreal and irrational, away from, while simultaneously complementary to, the analytic.

The multimedia result can best be described as ambient and can consist, for example, of 'trance' audio accompanied by 'psychedelic' visuals.

To get a better idea of what I propose, I repeat Gigerenzer's "Jungian" statement:

We think of intelligence as a deliberate, conscious activity guided by the laws of logic. Yet much of our mental life is unconscious, based on processes alien to logic: gut feelings, or intuitions. . . . We sense that the Dow Jones will go up. . . . Where do these feelings come from? (Gigerenzer, 2007, p.3)

My short answer should be clear by now. Market data, i.e. prices, capture collective human behaviour in concentrated numerical format that reflect qualitative (e.g. rhythmical) patterns. These resonate with System 1 functions we share in our (collective) unconscious. These functions, ultimately derived from numerical archetypes and possibly neuronally supported by mirror neurons, mediate these

feelings. But there is currently no systematic way to support this process and make it a robust method of investment research aimed at sensing market moods.

Gigerenzer subsequently discusses framing of empirical data and, referring to physicist Richard Feynman, he observes that different representations of the same information “helped Feynman to make new discoveries, and his famous diagrams embody the emphasis he placed on representation.” Specifically, in terms of the dual-system theories of mind Gigerenzer argues that intuition is richer than logic. Once again it echoes complementarity: entertaining different representations of the same data can appeal to a broader spectrum of our mind’s abilities, ideally enhancing our insights. In the words of Niels Bohr, and viewed in the context of the ‘informational exhaustive’ assumptions underlying the EMH:

Evidence obtained under different experimental conditions cannot be comprehended within a single picture, but must be regarded as complementary in the sense that only the totality of the phenomena exhaust the possible information about the objects. (1949, p. 210)

In short, the role of intuition as a *dynamic* gateway between the unconscious and the phenomenal is crucial in light of the fact that, according to complex psychology, the former is the shared uniform space where discovery starts for interacting minds. The representations which appeal to intuition, i.e. symbolic imagery, are often familiar but not always comprehensible. In the case of AVIR it consists of dynamically interacting sound and visuals derived from prices and other numerical market data. In general there is a large and growing literature on representing data by way of audio and/or visuals.<sup>200</sup> Specifically, Bettner et al. make the case that:

the mental pathways for the creation of auditory patterns and visual patterns are different. One forms anticipations of events in time; the other forms structures of points in space. One engages the emotions

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<sup>200</sup> For an overview, see Pauletto and Hunt, 2005. See also Wolfram, 2002, specifically [Wolfram Tones](#) as far as sonification is concerned.

more directly than the other. Each employs different parts of the brain. There are indeed reasons why we might hear something more or at least something else in the music generated by an algorithm than we might see in a picture that was created from the same data. (2009, p. 294)

My reasoning for the proposed experiment is that current investment research methodologies exclusively focus on analysis. They are not suited to address the internality of market states. Reducing this qualitative experiential level of a market state to the analytical quantitative level destroys the patterns we hope to account for. In order to understand this level we need, instead, to bring market data back into the interior (i.e. the mind and body) of the investor in a format that appeals to the mental abilities which facilitate the qualitative measurement, i.e. recognition, of such patterns. Ultimately, the method I envisage is aimed at systematically building experiential knowledge which would be complementary to any analytical knowledge. Such rebalancing, consistent with modern mental health views, is not only beneficial to our individual investor mind, for example by improving our decision making. It may also contribute to correct some of the major imbalances in the financial system, i.e. improve the health of the market's mind which is being 'brainwashed by algorithms'. As I stated more strongly elsewhere (Schotanus, submitted) how can we expect our creativity to generate the innovations in the real economy that we rely on for our progress and adaptation if these eventually are priced in a mechanistic way by a market that has become an automaton? Worse, accepting the market as an animated entity with a mind also means that the growing influence of these algorithms has a parasitic impact, i.e. the market increasingly becomes lifeless.

There is one more issue I need to address in this section, although I've touched on it in previous chapters. I have argued that moods, like the physical processes they are accompanying, are registered in prices. Prices, in other words, also reflect the



phenomenal dimension in discovery. But there is something peculiar about prices compared to other carriers of qualia, beyond their intersubjectivity. Let's compare moods with other phenomena to which we attach qualia, like smell and colour. Coffee, for example, is a substance which remains fairly static when it releases its smell. This is even more the case for an apple when it reflects its colour. Prices are, of course, linked to securities and the physical assets underlying these.<sup>201</sup> However, prices do not exist as physical substances independent from subjects who discover them and experience their qualia. At those moments they appear on the dot as numerical carriers of emotional charge whereby "measurement" of that charge only applies in the phenomenal sense. Collectively and recursively we dis- and recharge by buying and selling, maintaining the "strange loop" of price discovery which involves the three chains of the unconscious, the cognitive and the phenomenal. In short, what makes prices unique is that they are psychic self-references rather than physical originators of qualia. It is the reflexive dynamics involved in their discovery process which drive this, making prices "living symbols" in Jung's terms. To conclude, prices add meaning to our understanding of market states, over and above any knowledge derived from analysing them, because they convey how those states feel like. These are collective feelings although their uniformity is not always strong, i.e. they may not necessarily correlate with each and every subjective feeling.

Ultimately the question is not whether the market exhibits 'single-minded' states which can be captured by mechanical ('mindless') algorithms which basically are context-free rules. Of course it does, but that doesn't make the market an

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<sup>201</sup> Ultimately prices are units of currencies and in our modern times of fiat money currencies have no intrinsic value. The original underlying 'hard asset' of gold has been replaced by collective psychological traits, in particular trust in the monetary authorities to maintain the value of the respective currency. The latter requires, among others, that debt issued in that currency is serviced, supported by tax revenues. History has shown that that can be wishful thinking and recent record levels of debt to GDP offer a warning in that respect.

automaton, just like we are not automatons. The question is rather what triggers the market state to shift whereby investor behaviour becomes sensitive to context (i.e. contrarian versus crowd mentality) and what this implies in terms of research methods and tools.<sup>202</sup> This keeps finance's hard problem at the epistemological level, which is something we can handle. Instead of making a drastic ontological commitment, i.e. "the market is different from us", we accept that the market's mind puts limits on our understanding. The aim thus becomes to explore and possibly push the boundaries of these limits. This is the goal of my method. Specifically, based on my hypothesis I predict that systematically using a non-analytical research method to complement traditional (e.g. spreadsheet) analysis methods will improve the forecasting ability of the average user of this method, compared to exclusively using analysis methods. The Jungian caveat is that the benefits will likely disproportionately accrue to those psychological types which have a natural inkling for intuition and, so far, have been disadvantaged not only by the existing overreliance of analytical tools but, and related, by the lack of a systematic method to support their intuition and other functions of System 1.<sup>203</sup> Finally, although historic data is crucial for training purposes for all time frames, the frequency of data in combination with the look-back period defines the forecasting period, e.g. current intraday real-time data is the only format to assess "today's mood", but one needs more data to compare it to other periods like "this week's mood".

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<sup>202</sup> Again, mirror neurons provide a promising explanation for the neuronal dynamics involved in financial contagion and herding. See Chapter 5.

<sup>203</sup> This is a sub-hypothesis and I could be wrong. Also, this applies to the number of subjects, not the relative impact of the method per subject. Specifically, although AVIR will not appeal to "quants", it could potentially benefit them the most. In other words, AVIR could potentially benefit exactly those whose type suggests that intuition is their inferior function because AVIR offers a systematic way to use and develop it.

The initial experiment I'm about to propose (section 10.7) has less lofty ambitions to start off with. I will also describe briefly more ambitious extensions of the initial experiment.

However, the next section will describe, first, the software tools to use for the proposed experiment.

## 10.6 SOFTWARE TOOLS

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As we have seen, an investor is confronted with a psychological challenge at two integrated levels. First, she has to read other investors' minds, collectivised in the market's mind. In brief, she has to deal with collective psychology. Second, she is confronted with the personal psychological issues, e.g. heuristics, that are raised by investing while being part of this collective. Sometimes these issues have nothing to do with investing itself. In brief, she has to deal with the emotions, varying from stress to relief, to commit money to convictions. This challenge requires ways of overcoming it, apart from simply exiting or not entering the market, i.e. not participating.

The BBC documentary "Out of Control" (2012) discusses the influence of the unconscious on our behaviour and decision making.<sup>204</sup> Towards the end of the documentary (time: 54:50), one of the scientists, professor Scheider, discusses the generation of, what he calls, "a-ha signals". He pinpoints nicely the non-analytical state of mind which my method, with the help of the software I will discuss in this section, attempts to accomplish:

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<sup>204</sup> [http://www.bbc.co.uk/iplayer/episode/b01dglq/Horizon\\_20112012\\_Out\\_of\\_Control/](http://www.bbc.co.uk/iplayer/episode/b01dglq/Horizon_20112012_Out_of_Control/)

when looking at these images, the best thing to do is relax, you're getting into a zone

Nesbitt and Barass argue that adding audio and deepening the visual experience of data increases the human-computer bandwidth. While in agreement my method hopes to add to this by maximising the investor's "personbytes" (Hidalgo, 2015), in this case the amount of market knowledge that she can embody. Specifically, the aim is to optimise experiential knowledge by improving the attunement of the human mind to the rhythm of the market by presenting it in rhythmical format, i.e. as audio accompanied by responsive visuals. Both audio and visuals transform the market data in formats far removed from tables, charts and other standard, mostly static, research formats. In short, the tools I will describe shortly appeal to the non-analytical, intuitive capabilities of the mind which we use to appreciate the qualitative aspects of other minds. Often art is used as the form of representation and the music of modern "house" DJ/VJs (e.g. my fellow Dutchmen Tiësto, Armin van Buuren and Ferry Corsten) comes close to the repeated "beats" I have in mind with regard to market rhythms, often accompanied by dynamic audiovisuals.

These properties of the human mind, i.e. to perceive what is not immediately obvious analytically, are related, for example, to crowd thinking and creativity. The sensation produced by the conjunction of primal instinct and cognitive rationality is particularly overwhelming when experienced in a crowd. The type of creativity we are after in markets is "grasping the total situation", i.e. the market state in its rhythmical sense, particularly ahead of when the mood changes. Such creative breakthroughs at the thresholds of swings, i.e. at peaks and bottoms, require contrary thinking:

It may sound peculiar that contrary thinking is required to achieve creative thought . . . This, however, becomes self-evident when we realize that thinking the way someone else thinks results in

mimicry—a “copy-cat” requires the minimum of creative thought . . . Therefore, the inference is that to achieve any creativeness, some change has to be made. From this, it stands to reason that the optimum in creativeness must approach the maximum change . . . and the maximum change must be close to the opposite. (Neill, 1954, p. 148)

Concerning creativity, insights and music there are a number of links to Jung’s theory. Dreams, for example, can play an important role. Klinger (1999) showed that people’s daydreams and night dreams reflect “current concerns”, involving the full scale of human motivations. In an overview of daydreaming, also known as mind wandering and unconscious thought, McMillan et al (2013) conclude that daydreaming is “adaptive and beneficial” and “critical to our ability to simulate events in the future”. They point to research suggesting there are four broad adaptive functions:

1. Future planning which is increased by a period of self-reflection. Specifically, daydreaming may contribute to the successful management of long term goals (“delay discounting”/delayed gratification).
2. Creativity, especially creative incubation and problem solving;
3. Attentional cycling which allows individuals to rotate through different information streams to advance personally meaningful and external goals;
4. Dishabituation which enhances learning by providing short breaks.

Regarding music, William Benzon in *Beethoven’s Anvil* discussed the evolutionary functions and origins of music based on brain research. Among his interpretations is that music is a kind of daydream.

Weinberger (1998), in an overview of research, concludes that “the findings to date provide solid support for the claim that music increases creativity . . . That creative

potential can be increased is of great importance. That music appears to be an effective means of accomplishing this goal should be glad tidings for everyone.”

It is but a small step to aim for the type of multimedia experience of markets I have in mind. It involves three advanced specialised software tools:

1. **Compose**<sup>205</sup> transforms any numerical data into audio signals, i.e. music.<sup>206</sup> Files can then be saved in the industry-standard MIDI-format.
2. In turn, this format can be imported and played by **FL Studio**<sup>207</sup>, a so-called Digital Audio Workstation (or DAW) to compose, arrange, record, edit, mix & master music. Among others it can digitally synthesise numerous instruments, including whole orchestras.
3. Finally, via embedded links the resulting audio signals are dynamically, i.e. responsively and in real-time, visualised into animated spheres and other (three-dimensional) shapes via **Magic**<sup>208</sup>.

Visualisation software has more generally been used to represent complex data in unconventional formats in order to facilitate pattern recognition. As aforementioned, music visualisation has been used to enhance the experience of the music’s mood, for example via video projections at house/trance parties.

Combined these tools can create a format of market data which enables the user to experience this data dynamically as an audiovisual extravaganza. [Here is an early example](#) of an audiovisual production which I created by turning data (prices,

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<sup>205</sup> Alternatives include Audacity and Sonification Sandbox.

<sup>206</sup> In fact, it even translates (EEG) brainwaves into music. This application may be of use to test separately the state of mind of investors while experiencing market data in audiovisual format, e.g. to look for any correlation, synchronised in the respective audio signals.

<sup>207</sup> Alternatives include Pro Tools, Live (Ableton), Cubase, Logic, and Studio One.

<sup>208</sup> Alternatives include Acrobat After Effects, ZGame Editor and Resolume. Less advanced visualizers include Aeon, Morphyre and Plane9.

returns, volatility, and other time series) from a number of benchmark assets into MIDI-format (via Compose). This was subsequently imported into FL Studio to create the musical composition. The latter was exported as a collection of WAV-files which, in turn, were imported into Magic. It captures a specific period in finance history.

In terms of types of research, another example would be when investors perceive the recent market action as similar to previous historic period (or periods). By creating audiovisuals for both periods, the current and the historic, these can be compared by running them simultaneously. It will show audiovisually any differences in patterns which can enrich any insights from, say, a regression analysis of the underlying data.

Depending on how the data was transformed into Compose I would argue that AVIR can induce professor's Scheider's "zone" in order to achieve the qualitative "rhythmical" pattern recognition, i.e. the market's a-ha signals, we are after.

To conclude, I let Linda Bradford-Raschke, another famous trader (who majored in music), emphasise the associations between market rhythms and music:

A musical piece has a definite structure: there are repeating patterns with variations. Analogously, the markets have patterns, which repeat with variations. Musical pieces have quiet interludes, theme development, and a gradual crescendo to a climax. The market counterparts are price consolidations, major trends, and runaway price moves to major tops or bottoms. You must have patience as a musical piece unfolds and patience until a trade sets up. . . . In both music and trading, you do best when you're relaxed, and in both you have to go with the flow. (Schwager, 1992, pp. 306-307)

## 10.7 PROPOSED FORMAT EXPERIMENT

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As aforementioned this section contains a proposal, not a plan, for an experiment to be conducted sometime in the future. The below describes the basic version of the experiment, but there are many extensions thinkable.

The proposed format for such a 'hypothetical' experiment consists of the following:

A group of economics/business students are invited as subjects for an investment experiment that is spread over 3 half-days. The main requirements are that they are proficient with using computers but have no professional experience in investing.<sup>209</sup>

In a briefing session, subjects will get background information and instructions about the experiment in general. These subjects are asked to manage a portfolio which can contain (any combination of) an equity index, a bond index, and cash. Subjects are free to decide the respective weights of these assets in their portfolio<sup>210</sup>. The experiment is divided in three phases, each taking place in either the morning or afternoon of a different day, whereby subjects are exposed to data provided in:

- an analytical format (phase 1),
- an audiovisual format (phase 2),
- both analytical and audiovisual formats (phase 3).

The setting is a laboratory environment, for example that provided by Essex Lab<sup>211</sup>.

The test would be whether any of the formats, again in isolation (phase 1, respectively 2) or combined (phase 3), is superior in terms of the performance of the

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<sup>209</sup> An example of a potential extension to the basic set-up is to get an equal number of female and male participants who will be submitted to a Myers-Briggs test (see next section).

<sup>210</sup> Long only portfolio, so no shorting.

<sup>211</sup> See <http://www.essex.ac.uk/essexlab/>



subjects as expressed in the returns of their portfolios. The subjects will not themselves use the actual tools with which the data was prepared in the respective formats. This would require too much time in terms of training them in using the software. Also, the priority for this experiment is to see how subjects perform using the same data in the same standardised format for each phase. Finally, the difference in capabilities of using the tools may skew the outcome of the test too much. Instead, all they are required to do is to interpret the data (in that uniform analytical, audiovisual, respectively combined format) in order to make investment decisions.

In each phase the underlying market data is in the form of time series. Specifically, three samples each containing a sufficient amount<sup>212</sup> of consecutive (and normalised) daily data will have been randomly drawn from a full history of data from 1970 to the most recent date of available data. The data itself consists of realised historic prices, rolling monthly (20-day) returns, and monthly (20-day) volatility of benchmark indices representing the three main asset classes, i.e. equities, bonds, and cash, from a particular country or region. Per stage each participant will receive one sample, again randomly selected from the three samples. It means that each subject will eventually receive the same three samples over the full experiment but the order of the data will be different across the subjects. This removes any potential bias from momentum or reversal patterns in the samples to sneak into any particular phase.

In the first phase of the experiment, at  $T_0$ , the subjects will all receive a read-only spreadsheet with the data of their selected sample represented in tables and charts,

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<sup>212</sup> Sufficient in the sense of a base history to allow both analysis and listening. Personally I would think 4 years of daily data as a starting history is enough, as it is considered the length of a business cycle.

including summary statistics. They will be asked to invest a hypothetical £10,000 in any ratio across the three assets on a (simulated) monthly basis, initially and during the next twelve months, i.e. they can re-allocate part or all of their capital each month. They will have an hour to prepare for their start allocation by the end of which they enter their decision at  $T_1$ . Subsequently, every 15 minutes updated daily prices for a new month (roughly 20 *additional* new data points) will be provided in similarly formatted spreadsheets which now contain the previous and the new data. This means that the subjects have 15 minutes to update their portfolio, based not only on new additional prices but also knowing their investment performance. With this set-up, the first phase of the experiment will take a total of 4 hours ( $T_0$  to  $T_{13}$ ). The argument to use a 15-minute interval is to allow enough time for analysis, the latter being the prime cognitive ability of interest in this phase (compare with 'real-time' feed in section 10.8).

In the second phase, subjects will again be asked to manage a hypothetical £10,000 portfolio across the aforementioned assets. They now receive a different sample but transformed into an audiovisual file they can play on their computer.<sup>213</sup> Again, they will have an hour to prepare for their start allocation which they enter into the computer at  $T_1$ . The subsequent steps will be exactly the same as in phase 1, except that the format which contains the (previous and updated) price data will be audiovisual.

The final phase will see the remaining sample, determined per subject, represented in both formats: the spreadsheet and the audiovisual file. Subjects can now analyse the spreadsheet while viewing/listening to the audiovisuals of the same data. The

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<sup>213</sup> An variation would be to use the same dataset, unbeknownst to the subjects. This would help in contrasting the performance across the two phases as the same data is involved. The obvious risk is that subjects will discover this and thus distort their performance.

goal remains to manage a portfolio of £10,000 based on this new set of regularly updated data.

In light of the voluntary nature of the experiment, subjects can earn incentives (for an overview of the impact of incentives on experiments, see Camerer and Hogarth, 1999). Small prizes (£50) are rewarded to the top performer in each phase, as well as a higher prize (£200) to the top performer on average (but adjusted for the spread between high and low scores) across the phases. The latter prize is significantly higher to control the house money effect, i.e. to motivate subjects not to make extreme bets during any of the individual phases.

The main goal of the experiment is to test a number of forecasts based on my hypothesis. Specifically, I hope to show that across the group of subjects, so on average, phase three shows a statistically significant improvement in performance versus both phase one and two. I call this excess return  $R(3-1)$ , respectively  $R(3-2)$ . It is expected that phase one shows an overall better performance than phase two. However, I expect  $R(1-2)$  to be less pronounced, in absolute and statistical terms, than  $R(3-2)$ .

Other goals, in the extended variations of the experiment (see section 10.8), relate to differences in investment style/horizon, respectively investment personality. Specifically, I expect confirmation of the forecast that a change in the interval of investing, e.g. using a real-time feed of the data, will significantly impact the results. I also expect confirmation of the forecast that certain psychological types score statistically different across the stages.

This set-up, specifically the random selection of the samples per subject, counters some of the likely criticisms of this experiment, for example the claim that the periods are incomparable in terms of the statistical characteristics.

The claim that the subjects in phase three have become much more used to the audiovisual format which may explain the improvement in performance can be countered by randomly changing the order of the phases, e.g. have some subjects start with phase 3.

In the next section I will briefly discuss extensions (as variations) of the basic proposal for the experiment.

## 10.8 EXTENDED VERSIONS OF EXPERIMENT

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If this empirical test confirms my hypothesis, the method could potentially help investors to improve their assessment of market states, adding to the theoretical relevance of my thesis. However, this benefit is unlikely to be universal, both in terms of investment style (i.e. trading vs. investing) and investment personality (i.e. psychological types).

### **1. Investment Style**

An obvious variation to the above basic approach is to have a 'real-time' feed of the data. This does not necessarily require the use of high-frequency (intraday) data. In this particular case, the subsequent 12 months of daily data could be streamed in a much shorter interval, say every minute.

The argument that daily data can continue to be used is that the price data is fractal in nature as far as the rhythmical aspects are concerned. So, although daily frequency contains less noise it still contains the basic patterns, i.e. rhythms, we are after. Nevertheless, using intraday data could of course be another variation to the basic test.

Overall, it is to be expected that such a continuous feed of data will have a statistically significant impact on the results. Clearly it simulates more closely the circumstances under which traders make their decisions, rather than those of longer-term investors.<sup>214</sup>

## **2. Investment Personality**

Another interesting extension of the experiment would be, first, to choose an equal number of female and male participants in order to assess any gender bias in the eventual results. Next, to dig even deeper in the results one can submit subjects to a Myers-Briggs test ahead of the actual experiment. The aim would be to see whether certain psychological types score statistically different for this experiment. This would, in turn, be suggestive for the usefulness of the tools across these types, i.e. who would potentially benefit most from using AVIR.

Jung concluded that differences in behaviour between people originated in differences in dominance of the four psychological functions: thinking, feeling, intuiting and sensing.

How does this apply to investing? Type theory claims that the best decisions are made by a balanced mind. In other words:

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<sup>214</sup> I have potentially sourced the advanced trading-simulation software required for this variation.

- Both perception functions, i.e. sensing and intuiting, are used to 'record' all data.
- Both judgement functions, i.e. thinking and feeling, are used to 'assess' this information.

For many years Van Tharp has applied this framework, including the Myers-Briggs typology, to trading. He has discussed this extensively and I therefore refer to his website for more details: <http://www.iitm.com/articles/Personality-Type-and-Trading.htm>. For other research on personality and investing, see for example Richard Peterson's website, Market Psych: [http://tests.marketpsych.com/personality\\_test.php](http://tests.marketpsych.com/personality_test.php)

Derived from my hypothesis is the expectation that certain types will score better in the test so the software will be most beneficial to them. Specifically, although the longer-term benefits of using my method are potentially greater for Extraverted/Sensing users, I predict that, for this test, those who score "IN" in their typology will show the biggest improvement because the tools appeal to the functions they already feel most comfortable with, i.e. are dominant.

Moreover, even the general effects of music on behaviour are quite different in different people. For example, the effect to which background music affects learning and recall depends on this personality dimension (Furnham and Bradley, 1997).

## 10.9 CONCLUSION AND FUTURE VISION

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At the start of this chapter I indicated that, apart from describing a framework as a proposal for an experiment to test (sub-)hypotheses of my thesis, I would explain the method and tools with which the market's subliminal messages could be received. The method, AVIR, entails a dynamic and creative representation of market data via audiovisuals. Earlier reflections by others discussed such an approach along similar lines:

Another more anachronistic (the use remains limited) example of traders' apparent loss of a feel of 'the market' is software that simulates sounds of a virtual open outcry floor based on the information from the electronic system. This allows traders to react to the roar of the market which often signals volatile shifts in the market. The following is taken from an ad for a product . . . : 'Hear your electronic market in real time and real voice. Let our artificial intelligence software analyze and prioritize data faster than the human eye. Connect your mind to the market, not your eye to the screen.' The quote shows how the intention is to 're-embody' trading and to recreate 'connections' to the market (Arnoldi, 2006, p. 389).

My proposal takes this to the next level. The tools include advanced software packages. The following quote from Brett Steenbarger is in line with how Marcovici trained his rats and in the spirit of how I see these tools being used, namely repeatedly playing the audiovisual files to train attunement:

What traders can do to accelerate their learning is increase the intensity of their practice sessions, as an athlete would. Maybe practice trading in more than one market or *simulate a whole day's worth of trading in 15 minutes* . . . after looking at pattern after pattern, decision-making becomes second nature. (Stewart, 2002, p. 6; emphasis mine)

In terms of the market's 'big data', although noise to some is music to others, my argument is that more data is not necessarily better in understanding the market. Instead, the challenge lies in how we interact with its data in light of the fact that our current tools are limited, and often cause confusion rather than clarity. Gigerenzer and Edwards stated as much:

Statistical innumeracy is often attributed to problems inside our minds. We disagree: the problem . . . lies in the external representation of information. . . . Every piece of . . . information needs a representation—that is, a form. Some forms tend to cloud minds, while others foster insights. (2003, p. 741)

Many resources are currently expensed on gathering even more data to add to the already big data of markets. Although I am doubtful this will bring the rewards its advocates list in their promotions (if only because they focus, again, exclusively on analysis), I do not think it necessarily hurts. On the other hand, we ignore another and complementary approach: to use that data in a different way. This is what AVIR is all about. Ultimately, assuming tests confirm my hypothesis, I would like to see these tools being used on trading floors across the world, next to analytical ones like Excel and Matlab. Based on Jung's psychological types I suspect that they will not appeal to everybody but will benefit mostly those who are now disadvantaged by the overreliance on quantitative tools. In that respect, there is potentially a deeper consequence of using this methodology. Through experiencing prices the aimed-for knowledge of 'the state of the world' is "in one sense, self-knowledge. For knowing is a translation of external events into bodily processes, and especially into states of the nervous system and the brain: we know the world in terms of the body, and in accordance with its structure." (Watts, 1966, p. 100) This, I believe, is what is behind Soros' famous back pains (e.g. *Cymbalista*, 2003). It also links, for example, to Merleau-Ponty's work on the role of the body in gaining knowledge and understanding which may be of interest for others to further explore.

More broadly, due to the reflective nature of price discovery, where the individual mentalities fuse into the collective market mind via a dynamic feedback loop, the growing overreliance on quantitative research and investment methods has resulted in dangerous conditions. A rebalancing is long overdue and such levelling of the



playing field could make the overall market more balanced. Dare I say, lead to a healthier market mind?

That is my ambition although, as I mentioned, realising it will extend far beyond this Ph.D.

## CHAPTER 11 CONCLUSION

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To answer Ayache, this thesis is my modest contribution to “generalise the notion of price to domains other than financial” (2010, p. 44). There are numerous related topics which are important but, due to size constraints, can unfortunately not be discussed in this document. Instead I will now end my thesis with a few concluding remarks.

In summary, there are striking similarities between markets and minds. More broadly, the financial ecosystem operates according to similar dynamics as the natural ecosystem: individually and collectively we interact with nature and its resources by allocating our resources via competition and cooperation. This involves tensions centred on scarcity and uncertainty. Whereas mental demands (e.g. desire/wants) can be limitless, physical supply (e.g. of resources) to meet these is often limited. Vice versa, physical demands (e.g. imposed on us by our environment) can be limitless, whereas mental supply (e.g. emotional adaptation) to meet these can be limited. Forced to confront the unknown we go through a process of (sometimes painful) discovery and the resulting insights are our way to deal with the uncertainty involved.

As humans evolved the globe became more interconnected and markets became centres of excellence in these processes concerning our survival. They facilitate the exchange of goods, services and capital which are priced uniformly while, paradoxically, valued differently.

Prices form the empirical building blocks of our psychophysical bridge in modern society. Specifically, they are the amount with which we match the allocation to physical assets with the allocation to psychic ones. Both are scarce resources which enable us, at a massive collective scale, to adapt, i.e. gain exposure to/hedge against circumstances. They are the numerical meeting points in the market's mind where buyers and sellers collectively agree on quantity and quality. They capture the information that is doubly realised and, as numbers, have mental efficacy. In the words of Karl Popper, philosopher and mentor of George Soros:

There is no reason (except a mistaken physical determinism) why mental states and physical states should not interact . . . If we act through being influenced by the grasp of an abstract relationship, we initiate physical causal chains which have no sufficient physical causal antecedents. We are then 'first movers', or creators of a physical 'causal chain'. (1953, para. 6.3-6.4)

Numbers are the prime symbols of such abstract relationships. As far as complex psychology is concerned, in hindsight and looking at the path along which it evolved, it is no surprise that Jung concluded that the numerical archetypes form the essential and irreducible archetypes. However, his associate, Marie-Louise von Franz, was left to contemplate that "no means of measuring psychic intensities numerically has been envisaged". In light of the above, this search is over. Capital markets offer an empirical manifestation of psychophysical space because they generate measurable numerical data on "emotional . . . psychic processes". Prices allow, to use Pauli's terms, "physis and psyche [to] be conceived as complementary aspects of the same reality" (1952, p. 164). They form the elements of his "psychophysical unitary language". Price discovery, as the search for shared values, is Jung and Pauli's acausal connecting principle operating at a massive global scale. Von Franz points out that numerical archetypes symbolised in numbers "possess a dynamic, active aspect which is especially important to keep in mind. It is not what

we can do with numbers but what they do to our consciousness that is essential” (1974, p. 33). This archetypal dynamic is echoed in the words of Hayek when, talking about the “formation of abstractions”, he states that it

ought to be regarded not as actions of the human mind but rather as *something which happens to the mind* . . . [and seems] . . . never to be the outcome of a conscious process, not something at which the mind can deliberately aim, but always *a discovery of something which already guides its operation*. (1967, p. 43; emphasis mine)

In that process, ultimately of connecting physical and psychic events, the market’s apparent randomness is transformed into numerical patterns reflecting piled up coincidences, like the ‘unlikely’ events surrounding the collapse of Lehman in 2008:

When coincidences pile up in this way, one cannot help being impressed by them—for the greater the number of terms in such a series, or the more unusual its character, the more improbable it becomes. (Jung, 1947-1954, para. 971)

By extension, price discovery guides the other innovations in the economic system, the surprising novelty and creativity that make it a complex adaptive system.

Finally, instead of making a drastic ontological commitment like “the market is different from us in nature” we accept the stylised fact that the market’s mind puts limits on our understanding, which makes it an epistemological issue. I hope that the mind-body perspective clarifies this and other issues involved, including ontological ones. Specifically, by accepting the premise of the market mind we are confronted with the market’s mind-body problem. This drags us back into ontology but is a more comfortable route to take than starting from “the market as machine”. That, literally, is a dead-end.

Allow me to explain. Our involvement in markets and how they evolved was not a conscious decision or choice on our part, nor was the price mechanism centrally

planned and engineered. In the words of Hayek, we “stumbled upon it without understanding it” (1945, p. 528). Loosely interpreting both him and Gödel, we cannot design a system that is more complex than us. Instead, it is the (unconscious) interaction of human minds that generates the invisible hand of economics.

Compared to the mind sciences, which focus on the what and how, I ask *why* is there a hard problem? Are there scientific arguments why nature throws this up? The short answer is that it is in our own best interest. Consequently I would be surprised if we find a clear and complete solution to the mind-body problem. But let me give the long answer as well.

First, in the foregoing I implicitly argue that a healthy mind cannot be isolated from the collective sphere in which it is participating, in this case markets. This holds regardless of whether this participation is direct or indirect, if only because the economy’s ‘animal spirits’ know no boundaries, i.e. they touch everybody (or rather their wallets.) Unless one is willing to destroy the underlying phenomenal mood and the physical embodiment, e.g. by living completely isolated, any attempt to causally establish a ‘clean’ link between the subjectivity of an individual’s experience and her physical functioning is consequently futile. Second, and perhaps more importantly, in line with my earlier comments it is only logical that both the unconscious and the phenomenal have remained elusive because that’s why we survived. In so many words Jung once stated that archetypes can only be experienced, pointing to the direct link between the unconscious and the phenomenal. They are involved in trading but cannot themselves be bought nor sold. Let me put it more strongly, albeit in somewhat normative terms: numerical archetypes have to remain elusive if we want to survive. They are our collective ‘invisible hands’ that we subliminally

shake to complete trades in inter-human exchanges. They write Hayek's "unconscious rules" (1967, p. 57) for our mutual engagement in price discovery, the process that organises markets, allocates capital and, by extension, orders modern society within 'states of the world'. Beyond their quantitative properties, the resulting prices convey the qualities of a meeting of minds involved in such discovery, in particular an impression of shared symbolic meaning. In other words, if archetypes and qualia are captured (i.e. reduced) into an axiomatic system then the resulting products of the mind's forces become predetermined and can no longer be considered innovations. Instead these products, varying from technological breakthroughs to (ultimately) their prices, become mere cognitive concepts whose emergence can be pre-specified, e.g. in functions, via algorithmic enumeration. That is no longer discovery. Apart from various complexity (i.e. Gödelian) issues this would raise, it is a bleak prospect from a survival point of view: to become predictable would be dangerous to both one's health and wealth. Creativity is central in this regard. AVIR, the method that I propose to counter the growing overreliance on analytical methods, is my attempt to help investors to remain in contact with investment's creative processes for which, in the words of Heisenberg, "no rational formulation as yet exists."

Ultimately, if life itself is speculation we better embrace the elusive sensations concerning the uncertainty life throws at us:

And if you ask, "What are sensations, et cetera?" I can only answer, "Don't be silly. You know very well what they are. We can't go on defining things indefinitely without going round in circles. To define means to fix, and, when you get down to it, real life isn't fixed. (Watts, 1951, p. 55)

## APPENDIX;

### ARCHETYPES: A PERSONAL INTERPRETATION

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This appendix briefly describes my interpretation of archetypes. It is consistent with much of the foregoing, but is most relevant as an addition to chapters 3 and 5. The reason to put it at the end of this thesis is that I did not want it to distract from the mainstream interpretations, particularly provided in chapter 3.

#### **Interpretation of archetypes**

An archetype is an inherent mental subroutine in the form of an unconscious mandate to symbolise via a self-image, called the archetypal image. Stated differently, the archetype is an unconscious entity and the archetypal image is its conscious identity. Specifically, each archetypal encounter, particularly “archetypal life-challenging situations” (Panksepp, 1998, p. 123), invokes the neuronal firing pattern underlying its archetypal image. This makes an archetype self-referential/reflexive, whereby the archetypal image influences the release (and by extension shape) of the neuronal firing pattern while it emerges in consciousness, i.e. as it is experienced. It is this recursive feedback between the archetype and its image, combined with the interaction with other archetypes, which makes an “archetypal experience” dynamic and an “archetypal situation” evolve.

The unconscious, by way of the archetypes, enables the mind to deal with the uncertainty of the unknown, i.e. to imagine. It is in the unconscious where such novelty and innovations like ‘insights’ endogenously originate for the mind, a necessary requirement for any complex adaptive system to flourish. The adaptive purpose of archetypes is thus to provide prerational ‘surprise’ information as inputs to form categorised symbolic meaning, leading to an intuitive understanding of an emerging archetypal situation. In healthy humans this reduces incomplete knowledge and increases emotional fitness in terms of a ‘gut feeling’ response to the external surprises that form part of this situation. Often this response is of a compensatory and selective nature in order to rebalance emotional, respectively rational, excesses.

#### **Numerical archetypes**

Numerical archetypes are archetypes which symbolise via numbers, e.g. the natural integers. They are the prime archetypes because they enumerate, both cardinals and ordinals, thereby providing values required for selection, the main dynamic of evolution. Applied to the mind, and in terms of archetypal dynamics, numerical archetypes facilitate the selection by archetypes of “those contents which are best suited to themselves”. In general, numerical archetypes enable the numerical

operations required for all archetypal dynamics, typical examples being differentiation and integration, while bridging the mental with the physical.

I thus use the plural “numerical archetypes” not because each number requires an archetype, but because the numerical operations (e.g. biomolecular computation) mandated via archetypes involve multiple numerical archetypes. Their interaction, more than the interaction among any other archetypes, underlies the complexity of archetypal dynamics. It is striking how this is echoed by modern insights: “In nature’s pattern-forming systems, contents aren’t contained anywhere but are only revealed by the dynamics. Form and content are thus inextricably connected and can’t ever be separated.” (Kelso, 1995, p. 1).

In that light, numerical archetypes can be viewed as mandates to exchange values with, and thus influence, the emerging archetypal situation. Specifically, these include the coordinates for archetypal images to emerge in consciousness, i.e. in space time. In the final analysis, numerical archetypes perform the autonomous valuation of, i.e. attach a number to, our material state (e.g. wealth) as it relates to our mental state (e.g. wellbeing). To make my point in terms of finance I will regularly paraphrase Von Franz: “The question is not what we do with prices, but what they do with us.”

To conclude, as archetype number:

“. . . preconsciously orders both psychic thought processes and the manifestations of material reality. As the *active ordering factor*, it represents the *essence* of what we generally term ‘mind’.” (Von Franz, 1974, p. 53; emphasis mine)

Archetypes make up the collective unconscious, so as a whole we could say that it is the collective unconscious that mandates. Archetypes, being mandates, contain two types of instructions, both emphasising the primacy of numerical archetypes:

1. Those for the eventual shape of the image, i.e. its appearance in accordance with its symbolic meaning. Like a formula, this type of instructions shapes an internal mental image to closely match the objective ‘reality’, e.g. the Pythagoras theorem for a triangle, or the Mandelbrot set for a fractal. Vice versa, in case of capturing a mental image by way of an external (shared) object, its physical appearance should not influence its symbolic meaning. For example, whether a cross is made of wood, metal, or cloth should not change its interpretation, nor diminish its affect. Stripped of these and all other characteristics of its appearance (e.g. colour), there is ultimately some



numerical constellation (e.g. ratio) which captures the essence of the image in terms of its meaning. Number is irreducible which relates back to Von Franz' declaration that numerical archetypes represent the "essence" of "mind". This leads to something that clarifies the duality in the physical and the mental: no object can uniquely occupy two (or more) separate spaces.<sup>215</sup> This certainly applies to any physical object, like a table, but I would argue also for most mental 'objects'. For example, an idea is still fairly different among those who share it. Numbers however, as the essential symbols, are unique and thus seem to be the only objects that can occupy two or more physical spaces (i.e. brains) at the same time. This particularly applies when such a number symbolises the key characteristic of a unique physical object (which, as we just pointed out, cannot be shared). "Objectivity" gets a clear meaning.

2. Those for the physical route in terms of neural circuitry along which the emotional charge will build. I believe this 'road-map' is equivalent to what neuroscientists call "latent knowledge" (Dehaene et al, 2006, p. 209): "Knowledge stored in a latent form as synaptic efficacies remains inaccessible until it is used to recreate evoked patterns of neural firing. This constraint may explain . . . why we do not have conscious access to most of our mental algorithms". Again, this knowledge is believed to be numerical: the terms "efficacies . . . to recreate" imply some underlying scoring and/or scaling of a trigger, respectively its creation versus an original, i.e. compared against a benchmark.

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<sup>215</sup> Ignoring parallel universes, etc. Also, identical objects are not unique.

It is important to understand the role of archetypes in terms of bridging external (physical) events with internal (mental) perceptions and (bodily) responses. This holds specifically for the combined effect of the archetypal image as a perception with a symbolic meaning (i.e. a realisation) and the emotional response (i.e. a sensation) this evokes. There are three connected or overlapping dimensions to the "experience" of an archetype:

- i) The occurrence of a physical (external) event, i.e. the archetypal situation or encounter.
- ii) The (internal) mental representation of this event, i.e. the archetypal image;
- iii) The (internal) bodily response to both, i.e. the archetypal response or instinctive emotion.

An archetypal situation is a meaningful situation in the sense that it 'looks and feels familiar'. It resonates in that it gives rise to a similar understanding across all humans, i.e. it has occurred and will continue to do so in a universal format across cultures and generations. At the same time, despite its familiarity, an archetypal situation also *always* embeds uncertainty, because it involves the unknown. This makes each situation unique, with its own idiosyncratic character.

A highly emotionally charged example is the terminal illness of a son's father<sup>216</sup>. This situation is recognised by other individuals as well (not only at the same time, but also through time and across cultures) which makes this dimension objective: "Mr X is dying". The second dimension is the internal projection of the first dimension: it becomes an image of which the symbolic meaning turns partly subjective, i.e. "my

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<sup>216</sup> Although this is not of particular relevance here, traditional archetypal elements in this situation include the Father (figure), Death (and Rebirth), and the Anima/Animus .

(his) father is dying". Next, and crucially, is the third dimension which projects the image externally again, because it is expressed, thereby shared, and reflexively impacts the archetypal situation, i.e. "I am (he is) like this because my (his) father is dying".<sup>217</sup> Consequently, it is this dimension (Jung's "consequence") which becomes the re-entry that continues the strange loop<sup>218</sup> in the archetypal dynamics: it feeds on itself to renew itself, like the Ouroboros, with specific subjective inputs into the objective starting situation. In chapter 5 I will divide this strange loop into a chain of three components: the unconscious origin (i.e. archetype), the cognitive embodiment (i.e. functional behaviour) and phenomenal culmination (i.e. quale). Throughout the archetypal experience embeds uncertainty which, in turn, gives rise to the archetypal expectation (to be discussed later.) Also, it is the third component which not only completes<sup>219</sup> the archetype "as an experience" in consciousness, but also hints at why science has so much trouble explaining the "hard problem" of consciousness: more than anything it is the phenomenal quality (i.e. quale) of emotions which defines consciousness and make us aware, ultimately of our subjectivity in the broader world. However, due to their unconscious origins and their intersubjective contagion (e.g. their regression in crowds) they are the least rational (i.e. cognitive) and thus hardest to scientifically capture.

Based on the brief overview of Jung's own comments in the previous section, as well as my preliminary interpretation, there are a few important additional points to make about archetypes. These follow in the next sections of this chapter.

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<sup>217</sup> To be clear, this interpretation of empathy reflects the transfer from the collective unconscious to the collective consciousness of shared emotions. Specifically, the sentence should be read in flexible terms, e.g. "I am like this because his father is dying".

<sup>218</sup> Beyond fractals, Hofstadter (2009) describes innovative ways with which he creates "strange loops", like video-feedback, as metaphors for the self-referential loops in the mind. His book is also highly personal, following the death of his wife.

<sup>219</sup> As in 'phenomenally realises'.

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