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*Financial bubbles and their magic:
asset price as a heroic journey in the
financial markets*

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Financial bubbles and their magic: asset price as a heroic journey in the financial markets

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Abstract: Why do financial crises appear unprecedented in spite of being a rather regular occurrence across countries and time? There are many answers from various schools of finance and economics, including Minsky's financial instability hypothesis in which *systemic stability endogenously* results in instability. We explore the inclusion of observed human behavior in an endogenous framework by engaging with anthropological concepts such as myth, ritual and magic that structure and explain our behaviour, and by extending the concept of agency from human to non-human. We also point to the possibility of better understanding our position in the mythological cycle using the new social media data. The aim of the article is to offer a holistic framework of interpretation of causes and circumstances of economic crises, using the tools of economy, semiotics, and economic anthropology that would account for both the universality of these crises and for their particular occurrences that always seem unique.

Keywords: Actor-Network-Theory, semiotics, agency, asset pricing, financial bubbles, Minsky

A short account of the historicity of bubbles

In 2008 an 'unprecedented' financial crisis hit the markets, plunging asset markets and bringing economies to the brink of collapse. Financial giants deemed 'too big to fail' defaulted. The scale and impact of such crises suggest a degree of 'surprise' but the universality across time, markets [1], and investor types makes the 'unprecedented' part difficult to digest. In fact, financial crises seem to be a constant of history ever since debt become operational, some 5000 years ago.

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In contrast to the general population of big national economies such crises also happen in a smaller pool of extremely sophisticated investors. Antti Ilmanen comments on a smaller crisis called the 'quant-meltdown' that took place in summer 2007 and pre-dates the 2008 crisis.

As often happens, this success sowed the seeds of its own demise. When the turn in fortunes came in the summer of 2007, crowded positions and synchronous liquidations caused a "quant meltdown", which seemed mysterious at first but which really just well reflected the extent to which quant managers had engaged in herd behavior by all following similar value indicators. [...] With some hindsight, the equity value style itself was "overvalued" before the summer of 2007 and undervalued after 2008. [...] Other important value-oriented quant managers were run by FF's colleagues and former students. (Ilmanen, 2011:251).

The 'FF' refers to Gene Fama and Ken French who are finance professors and world-renowned experts in quantitative and value investing. One of Fama's contributions is the efficient markets hypothesis in finance, which in its strong form states that stock prices embed all available information, which would make such 'overvaluation' or 'undervaluation' troublesome to justify and any 'herding' difficult to explain.

David Graeber (2011) provides, from an anthropological perspective, a history of debt in its first five millennia of existence. He argues that the form of debt is highly dependent on socio-political organization, and so are monetary economies, implying thus that the magnitude of crisis is dependent on the socio-cultural context. MacKenzie (2011) identifies the difficulties of offering exclusively rationality-based explanations for debt crisis, and considers debt as a phenomenon with sociological character.

The question that imposes itself is: is there an underlying structure to the human behavioral patterns that creates current financial crises despite the historical awareness of previous ones? This is not a new question and the answers mainly seem to come from three different sources - rational school of financial economics, the behavioral school of economics, the social constructivists and post-Keynesian economists.

The rational school of financial economists tend to call the crises accidental: essentially, an un-forecastable and statistically plausible bad roll of dice on the part of an efficient market. The behavioral school of financial economists suggest human cognitive biases as a plausible reason. Among the post-Keynesians

economists, Hyman Minsky (1992) a relatively obscure economist prior to the crash (Lahart, 2007) was rediscovered. His work suggests that financial systems are inherently unstable and this view of *endogenous* instability seems to be close to the social constructivists' idea that crises are responses to the society's need to change itself [2]. The media serves our need for narratives by suggesting very specific and circumstantial explanations based on the paradigm of 'natural evolution', in which these crises were 'mistakes'. The particular stories tend to have greedy villains selling impossible dreams, incompetent officials not checking them and the ignorant and suffering common man.

After the crisis, prevalent explanations consider the practices that caused the *particular* crisis as fads or 'fashions of the moment'; the public finishes by identifying an a posteriori obvious and fixable market design-flaw that it has learnt from. This discussion usually ends with the analysis of 'difference' of any current crisis' elements offered as explanation [3] - and a synthesis legitimates the engagement in the next similar cycle.

Each approach has its criticisms. While behavioral finance argues that the rational school of economics doesn't recognize the 'humanness' of humans [4], the rational school argues that the behavioral economics and finance lacks structure and opportunistically interprets random events with an anecdote of choice (Fama, 1998). Neither of these schools make endogeneity a central feature of the system. On the other hand, the explanations based on endogeneity, such as the ones offered by Minsky and Widmaier et al (2007) almost eliminate *individual* human behavior. How can we explain the cyclical performance of asset prices, the creation of economic bubbles and financial crises in an endogenous structure that naturally includes human behavior? This article is an intellectual exploration meant to add possible paths of inquiry to this ongoing conversation. It uses anthropological concepts such as myth, ritual and magic that structure and explain human behavior in order to expand the theoretical framework centered on endogeneity. We look at the market as a complex network of human and non-human actants [5] in which the asset price is endowed with agency. Thus, the scope is to find explanations at the intersection of these fields, and to extend the understanding of agency on the market from human to non-human. Moreover, the article claims that emphasizing the non-human agency will help to better understand the deeply human roots of economic crises, and to accept them not necessarily as unavoidable but as a 'natural' consequence of the fact that economy is fundamentally about humans engaging in exchanges in environments that are both culturally and historically marked. This

is the reason why the authors opted for a multidisciplinary approach that may be confusing or counterintuitive at moments.

The article will first present Minsky's financial crisis sequencing and his insight that crisis is an effect of endogenous conditions of market organization, not an effect of exogenous interferences. We then explore a variety of explanations for financial bubbles, mainly divided between the rational and behavioral economics schools. We propose a departure from these anthropocentric perspectives by introducing the actor-network theory and the role of the non-human actants. From this perspective we present an analysis of myths and the organization of their narratives around a central hero, juxtaposing the hero's mythical journey with the evolution of the asset price during a financial bubble.

The latter methodological tool not only allow us to make sense of widespread language such as 'market/price behaves [6]', but also to give a concrete meaning to this language and to link it to social and cultural processes.

The conclusion suggests a methodology for interpreting the narratives embedded in the social media data as the related asset price evolves on its journey. The argument directs to a possible method for an early identification of assets that may become bubbles and indicates a new possible bubble in the making.

Crises and bubbles: Minsky's contribution

The Financial Times lexicon defines an asset bubble as a time 'when the prices of securities or other assets rise so sharply and at such a sustained rate that they exceed valuations justified by fundamentals, making a sudden collapse likely- at which point the bubble "bursts"'. Typically when there is a collapse in the asset market there is a financial crisis. So the question becomes how do these bubbles come into being?

During the recent financial crisis of 2007 to 2010, the theories of the relatively unknown up to then economist Hyman Minsky, received a lot of attention. 'Minsky Moment' became a popular phrase. A Wall Street Journal article published on 18 August 2007, defines a Minsky moment as 'the time when over-indebted investors are forced to sell even their solid investments to make good on their loans, sparking sharp declines in financial markets and demand for cash that can force central bankers to lend a hand.'

The chief contribution of Minsky's (1992) financial instability hypothesis is that it renders the business cycle and occasional crashes structurally endogenous by having prior stability breed subsequent instability. Minsky identifies three types of financing units – hedge, speculative and Ponzi. Hedge financing units are able to fulfill contractual obligations from their cash flows and they typically have more equity financing. Speculative financing units meet the payments based on existing income but cannot repay the principal amount. Ponzi financing can neither pay the principal nor the interest from their operations. The greater the weight of speculative and Ponzi financing units in the economy, the greater their instability. Minsky's hypothesis of financial instability is based on two propositions:

The first theorem of financial instability hypothesis is that the economy has financing regimes under which it is stable, and financing regimes in which it is unstable.

The second theorem of financial instability hypothesis is that over prolonged periods of prosperity, the economy transits from financial relations that make for a stable system to financial relations that make for an unstable system. (Minsky, 1992: 7-8)

Minsky argues capitalist economies tend to move from a financial structure dominated by hedge finance units to a structure weighted by units engaged in speculative and Ponzi finance, and that monetary tightening (increasing borrowing costs) in an economy with large speculative and Ponzi finance will lead to a collapse in asset prices.

Finance practitioners and some academics have taken Minsky's ideas and characterized various stages of bubbles: displacement, boom, euphoria, profit-taking, and panic. See Table 1 for description.

Table 1 Minsky's five stages of the bubble

Classification	Description of Stage
Displacement of interests	Technical shock or innovation: Exogenous shock to macroeconomic system that leads to higher anticipation of future profits
Boom	Higher expectation of future profits leads to easier supply of credit and more borrowing. There is also an actual increase in profits

Classification	Description of Stage
Euphoria	Rapid increase in prices as boom runs into capacity constraints. Thus, it verifies the power of the 'new element' and creates euphoria and leads to more people investing
Profit taking - Smart money retreats	Excessive leverage and speculation which involves buying assets at prices higher than their income as they see the rapid price increases and creation of wealth. "This time it is different." Regulators may also change their opinion by now.
Panic and implosion	Indebtedness increases at 20 to 30% a year and is not sustainable and eventually there is some confrontation with reality and the thing implodes

Source: Based on Cassidy (2008).

Variations in asset prices and their explanations

Financial economics: 'rational vs. non-rational behavior'

The prices of assets such as houses and the stock market can vary substantially over time. Financial economists describe the time variation in our aggregate economic activities (real economy) and the financial value we put on these assets (financial economy) across time in terms of business cycles. Business cycles are periods of expansion and contraction of the level of economic activity around its long-term growth trend. Just as there is fluctuation in economic activity, there is considerable variation in the financial valuation of assets.

A priori calling a price variation a bubble or a crash implies predictability: if an asset price is in a bubble or 'too high', it must then come down and if it is in a 'crash' or the asset price is 'too low', then it must subsequently increase.

This asset price variation, as well as price predictability have been the topic of much scholarly debate in finance (Cochrane, 2005). The debate polarized two main camps - those who emphasize rationality in economic exchanges, and those who accentuate cognitive biases away from the hyper-rational *homo-economicus*. The rational camp suggests that we are risk averse and engage in self-interested behavior at least at the aggregate level. The counter intuitive insight of this school of thought are that

the very existence of informed and self-interested behavior eliminates profits other than the reward for the aggregate risk aversion, and hence changes in asset prices are (mostly) rendered unpredictable. As such any asset price 'bubbles' and 'crashes' are accidents with no inherent predictability but plenty of a posteriori explanations with a healthy dose of hindsight bias. For example, Cochrane (ibid.) advances a rational explanation suggesting that at least some of the variation and predictability in the prices of financial assets is linked to variations in the business cycle or real economic activity.

Behavioral economics concentrates on the apparently non-rational choices that humans make when they engage in transactions of any kind. Behavioral finance has mapped some of the known foibles of human nature and our fallible behavior. In its admission of the limited rationality we possess, behavioral finance looks at psychological biases that depart from the idea of a hyper-rational self-serving *homo-economicus*.

Shiller (2007) represents the behavioral camp when he suggests that observed price behavior is at least in part generated by cognitive biases such as a uniqueness bias that manifests as follows: economic actors underestimate the number of possible competitors in the market while thinking highly of themselves and their associated investments. There is a tendency to engage in narrative-based thinking rather than purely quantitative analysis. Shiller suggests that investors do not seem to understand the supply responses of housing or asset markets to price increases. For example, people imagine that the city they live in is unusually attractive and hard to replicate. In their book, Akerlof and Shiller (2009) approach the market in terms of socially prevalent narratives of a promising future. Their argument centers on how we are 'fooled' by stories well told. These stories make us suspend disbelief, gain unfounded confidence, and invest in assets based on the promise of higher future returns.

Anthropology: who's acting? Human vs. non-human agency

The Financial Times Lexicon defines the market as a 'generic term for an exchange that facilitates the trading of financial instruments, such as stocks, bonds, foreign exchange, or commodities.' This is an economics-based definition. While economists concentrate on the nature and (re-)sources of economic behavior, anthropologists raise the question of the nature of agency and actants themselves and make efforts to redefine markets and actants.

Economic anthropology has been marked by dispute between substantivists and formalists, similar in spirit to the one between the behavioral and rational schools of financial economists (Hann and Hart, 2011). In the tradition of Mauss (1900 [1925]) or Malinowski (2014 [1936]), and following Polanyi's (2001 [1944]) work, the substantivist school questions the utilitarian view that reduces societies to economic exchanges based on self-interest and driven by a hyper-rationalist *homo-economicus*. The substantivist approach is sustained by ethnographic arguments that describe specific ways of engaging in *exchanges* particular to the diversity of cultures studied. Formalists, on the other hand, postulate that the universalism of the principles of economics apply everywhere, irrespective of the socio-cultural characteristics of place. Where formalists extend 'the logic of rational egoism to settings..., substantivists [argue that] reciprocity and redistribution [are a] more dominant form of integration...than informal markets' (Hann and Hart, *ibid.* 66).

Theories of economic anthropology have diversified to integrate feminist critiques (Leacock, 1978; Strathern, 1988; Green, 1997; Sirman, 1990), and increasingly specialized approaches such as the anthropology of money (Zelizer, 1994; Maurer, 2006), of finance (Hart and Ortiz, 2014; Ho, 2009; LiPuma, 2004; Ortiz, 2012), and of consumption (Douglas and Isherwood, 1979; Miller, 2012), to name just a few, simultaneously moving away from and continuing on in different forms, the conversation of formalism vs. substantivism. The core of the dispute continues to center on the nature of the actant of the market and its approach to exchanges. The question remains as to not only what actors in the market do, but who are they, and what are they made of? What if the actors are not only human beings?

There is a long tradition in humanities of extending the concept of agency to non-human actors. One important application of this approach is the work of Callon and Muniesa (2003) who analyze the specific interaction of three constitutive elements of markets: economic agents, economic goods, and economic exchanges. The authors postulate that we can only understand the market as a collective computational device that crunches all three elements if we do away with the split between human agents and their products. They propose an understanding based on co-production that helps us move beyond the separation of subject/object and facilitates a deeper understanding of both objectification and singularization- in other words the calculability of sale-able things, or goods (that are not necessarily tangible objects). In their view, the market is a distributive calculative agency, formed by multiple actants that assign prices to goods.

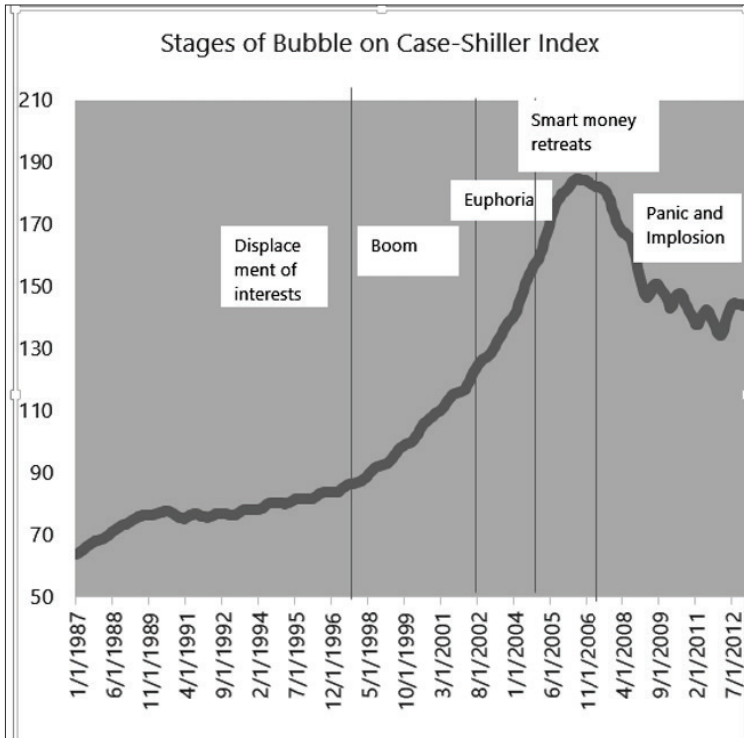
Pondering the effect and interpretations of apparently exogenous shocks on markets or systemic phenomena, Blyth argues (2003) that 'structures do not come with a set of instructions.' We argue that in fact they do, but that the 'instructions' are not to be found within the dynamic of the phenomenon itself, but elsewhere, in what anthropologists call myths and mythologies. We attempt to identify an overarching framework for the crisis that is not that of a unique market or a unique type of capitalism, but that of a general story-telling human behavior [7]. Within it, one must see the particularities of each manner of arranging the narrative and differentiate among its elements and human and non-human actants.

Our hypothesis postulates that 'the rise and fall' of almost everything, from empires to asset prices, is a fundamental trait, codified in universal human productions known as myths, that organize and explain human responses to the realities of their environment – be it economic, socio-cultural, or natural. The additional benefit to this approach is the recent availability of unprecedented volume of data. Today's digital world with billions of tweets, facebook posts, internet search data, and stories stored for posterity gives us access to virtually all important narratives in which we engage and that point to the actants' formation and interactions. Thus it provides an invaluable source for identifying and analyzing the organization of today's mythologies.

The bubble and the myth: the parallel

In this section we propose a parallel reading of the narrative of the housing bubble in the US in 2008 and the founding of Thebe in Hellenistic mythology. Shiller (2007) provides a more detailed account of the crisis by including social sentiment and narrative and compares it to other boom and bust cycles. Figure 1 is an illustration of a Case-Shiller Home Price Index that tracks variations over time of single-family home prices in the United States. Cumulatively the index rises from a value of 87.26 at the beginning of 1998 to 184.21 by the end of September 2006 – an increase of 111%. The fall is similarly dramatic, with the index plummeting from its peak of 184.21 in September 2006 to a low of 137.75 by February 2011, a decrease of 25%.

Figure 1 Case-Shiller United States Home Price Index



Source: Bloomberg.com

Most homebuyers in the United States borrow to buy a home (cf. Reuters agency 2015) hence credit conditions are likely to influence prices. The Depository Institutions Deregulation and Monetary Control Act of 1980 made it possible for all thrifts (savings and loan associations) to make loans (Robinson, 1980). At the same time, there was a deregulation of interest rate setting and other banking functions as well [8]. In addition, the Garn-St. Germain Depository Institutions Act of 1982 allowed for adjustable-rate mortgages, wherein the interest rate charged to customers could change according to broader economic conditions. The house price index appreciated from the late 1980s up to around 1990. However, due to a multitude of factors, including the Savings and Loan (S&L) crisis, the 1990-1991 recession, and plummeting consumer confidence, we see a drop in the index in 1990-1991.

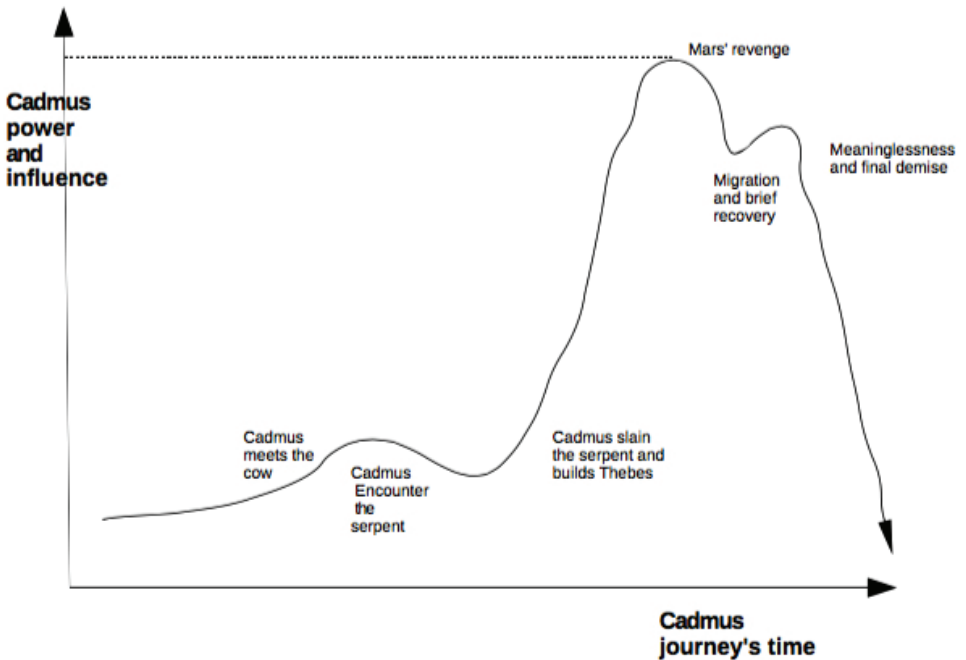
Subsequently there was a boom in the late 1990s that lasted until 2007. Public perception seems to have been one of high optimism, more prosperity resulting in a rising tide of new capital (The Economic Look, 2005; Shiller, 2007; Byun, 2010). Unsurprisingly, many theories advanced for the late 1990s to 2007 boom [9] share in common a story of increased credit made available through nontraditional, structurally riskier, non-amortizing, adjustable-rate mortgages by a 'shadow-banking' sector, which had replaced traditional, amortizing, fixed-rate mortgages (Poszar et al, 2010).[10]

Eventually, speculators were not able to pay their loans, causing a sharp rise in the default rate of U.S. mortgages [11]. This contributed to triggering panic in the shadow banking system and a banking panic after a period of 75 years of relative stability in the United States (Gorton, 2009). Subsequently, there was a bank run on money market funds [12] and an implosion of the large shadow banking system (Geithner, 2008). The stock market declined 45% in 2008 from its 2007 high, and total retirement assets fell 22% from \$10.3 trillion in 2006 to \$8 trillion in mid-2008 (Altman, 2009). The United States government and the Federal Reserve intervened to commit more than \$13 trillion in temporary loans, liability and asset guarantees, and other government programs (Supervisory insights, 2009).

A look in a distant past and in an apparently non-related domain may give us some food for thought: more than 2000 years prior to this, Cadmus, son of Agenor, the king of Phoenicia and brother of Europe, left his hometown to search for his beloved sister, whom Jupiter had kidnapped. After a long and unsuccessful search, Cadmus consulted the oracle of Apollo who advised him to follow a cow and to build a city where the cow shows him to, and to call the city 'Thebes'. Cadmus finds a cow that guides him to a blessed place. He decides to *perform a ritual* of sacrifice to Jupiter and sends his men to fetch water. They find an immaculate source guarded by a giant serpent and after a short fight all lose their lives. Cadmus goes out in search of them, finds the serpent, and kills the monster. A voice commands him to take the snake's teeth and plant them. Two armies arise from them. They fight to death leaving only 5 soldiers to help Cadmus build Thebes. He is given Harmonia, the daughter of Venus, to be wife. At this point Cadmus's life was at its peak - the Gods themselves came to the wedding and Vulcan gifted the bride a necklace of his own creation. Nothing seemed to threaten Cadmus's power and influence. However, the serpent slain at the founding of Thebes' was the favorite of Mars. Mars took revenge for the serpent's slaying by killing the daughters and grandchildren of Cadmus and Harmonia. Cadmus subsequently abdicates this throne and together

with Harmonia, leaves Thebes for the country of Enchelyans. There they are received with honor and found the cities of Lychnidos and Bouthoe. But their lives feel meaningless and by their own volition, the gods transform them into serpents. Figure 2 is an approximate rendering of Cadmus's power over the narrative in graphic form. We note that Mars's revenge occurred when Cadmus was at the pinnacle of his power, influence, and fame.

Figure 2 Cadmus and the founding of Thebes



Source: All tables and figures by the authors, unless otherwise specified.

Below we read the housing bubble of the 2000s and the myth of Thebes together. The Case-Shiller Home Price Index is the hero of our story. As we unpack its journey, we find that the price path of the index described earlier is surprisingly similar to the story of Cadmus, as exemplified in the table below.[13] [14]

Table 2 Parallel reading of Cadmus's myth and the Housing Bubble

Description of Stage	Housing Bubble	Cadmus' story
Displacement of Interests	<p>a. 1980 the Depository Institutions Deregulation and Monetary Control Act – allowed thrifts to make consumer loans with little or no oversight.</p> <p>b. 1985-1991 – the Asset Price index had a period of rapid increase, followed by a drop in 1991 as S&L crisis hit. Brief recession in 1990-91, consumer confidence plummeted.</p>	<p>a. Beginning of Cadmus's journey who, after fruitless searches, finds the cow that indicates him the ideal placement of Thebes.</p> <p>b. The encounter with the serpent indicated a drop in Cadmus' powers.</p>
Boom	<p>The financial tools, regulations (1997 Taxpayer Relief Act) and instruments created at the end of the '90's, and their accessibility for the public formed the Asset Price's army that conquered people's doubt and convinced them to join in a celebratory path of investing in the future of the hero.</p>	<p>The divine intervention after killing the snake that turn its teeth into an army servient to Cadmus paved the path of our hero's rise.</p>
Euphoria	<p>Low interest rates by the Federal Reserve, low mortgage denial rates, and the refinancing of mortgaged property resulted in accelerated increase of the Home Price index.</p>	<p>Cadmus builds Thebes, marries Harmonia in the presence of Gods, and rules under Gods' blessing.</p>
Profit taking – Smart Money Retreats	<p>Goldman Sachs repositions its portfolio from being an investor in the housing market to betting against it in 2007.</p>	<p>Cadmus abdicates and leaves Thebes to found the cities of Lychnidos and Bouthoe.</p>
Panic and Implosion	<p>2008 Crisis</p>	<p>Mars's revenge for slaying the snake follows Cadmus and his life descends into meaninglessness. He himself is transformed into a serpent.</p>

Similar to the story of Cadmus, the factor that initially led our hero to gain power – credit – ultimately provoked its fall and demise. In the case of the housing bubble, the practices mentioned above: refinancing (mortgage lending), Asset-Backed Securities (ABS), and Collateralized-Debt-Obligations (CDO) seemingly held the promise of a rapid and secure individual enrichment, but in the end backfired and caused the burst of the Asset Price bubble. The migration of Cadmus can also be seen to correspond with capital spreading and house price bubbles in various other economies, with the subsequent meaninglessness and emptiness corresponding to empty office and residential buildings across the world from Iceland, to Ireland, to China. Both stories follow a similar narrative scheme, and both heroes depend on the actants' help and approval in order to continue their journey. Neither was a hero before their journey, and they both gain agency as an effect of interactions among actants while the story develops.

Semiotics of the financial market: Gremias and the Myth of the Asset Price

Why is it that some stories have the capacity to seduce, while others pass by unnoticed? And what does the entire cycle of bubble creation and burst tell us about human economic behavior? In our argument, these questions can only be answered if we do away with human beings as sole agents and follow how the behavior of less corporeal entities such as language, exchanges, goods, or institutions create the pattern of a bubble's development. We look at the *evolution of the bubble itself as a story* created by the aggregated actions of human and non-human actants in order to understand the mechanisms of both the common structure and particular historico-cultural variations.

A first observation is that, beyond the various stories of success that engage the 'animal spirit' in high risk-taking actions, the resulting larger narrative of the bubble follows a pattern that repeats itself. It is a recurring story, in other words a myth. Regardless of its truth value, a myth is a meta-story through which we define reality and organize ourselves and our actions to suit its context. Myths take many different forms while embracing a similar scaffolding that in fact serves as the support and justification of our method of acting in, and interacting with, the world [15].

Philosophers, anthropologists, and psychologists alike have engaged in the analysis of myths and their mechanisms. Friederich Nietzsche, Franz Boas, and Carl

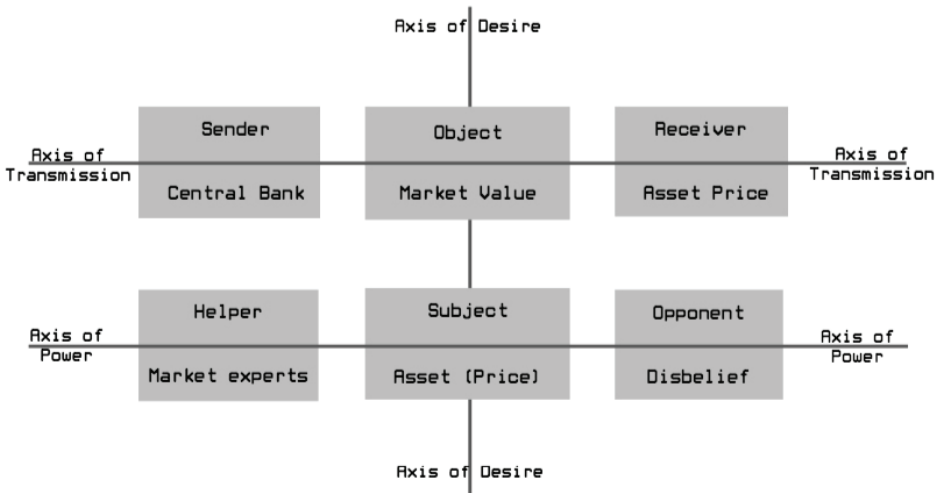
Jung are just a few of those who have tackled with universal mythologies in their different manifestations. They have all observed that at a fundamental level, human manifestations are rather monotonous and universal in the way we build our social structures and relationships, and in the way we relate to major life events. One of the most popular views is Carl Jung's psychoanalytical approach to personalities from the perspective of mythological archetypes. Following the observations of anthropologists such as James Frazer, and those of his mentor Sigmund Freud, Jung states that manifestations of human consciousness in their infinite individual variations follow from archetypes of personalities encountered in a host of mythological accounts, regardless of their culture of origin. Thus, we engage in similar behavior based on our archetypal model that taps into the 'inexhaustible energies of the cosmos' (Campbell 2008 [1949], p.1). This behavior is not only individual, but also social, in that our structures and systems of relations are based on, and expressed by, our mythologies.

Claude Levi-Strauss (1983 [1968]) brilliantly reveals how mythologies are structured around binomial oppositions, for example, presence and absence, hot and cold, cooked and raw, friend or enemy. He uses the idea of binomial opposition to support his assertion of the universality of the human mind, arguing that binomial opposition is the mere reflection of the organization of human brain in two hemispheres, and its projection in the real world. Writing before the advent of cybernetics, Levi-Strauss uses music, another form of language, to better illustrate his ideas. Contrary to what we tend to believe at first, music is made of up more than just notes. Music without the pauses between the notes that confer melody and rhythm would make no sense. Greimas uses binomial opposition in his semiology of narrative. For Greimas, the agency of the hero is the result of a series of actions by actants placed in three axes of binomial opposition: subject/object (the axis of desire), helpers/opponents (the axis of power), and senders/receivers (the axis of transmission). On the axis of desire, we find a hero (the subject) that desires an object. A sender will transmit the object to the hero, however the hero must go through a journey in order to gain the object. On the axis of power, the subject (the hero) is caught between helpers and opponents who constantly appear during the journey. In the journey from "subject" to "receiver", the emerging hero uses helpers to overcome opponents, sometimes to the point of abusing them. This leads to the unavoidable demise of the hero.

In the figure 3, we apply Greimas's actantial model to illustrate the actants and agencies of the market. In this model, each of the major actants are themselves a

combination of networked entities and actions. The scheme above represents the relationships between the actants in the myth of market bubbles. For example, central banks create the possibility of an increase in market value by lowering asset risk premia through easy monetary policies. The asset price desires that increase, and in order to obtain it appeals to helpers; i.e. market experts.

Figure 3 Interpretation of Greimas semiology of narratives as applied to the 'Myth of the Asset Price'



The opponent is the disbelief or lack of confidence of the general public. Negative growth shock is one of the expressions of this disbelief. Disbelief is overcome with the help of magic elements similar to those used in stories that tame disbelief and unleash the animal spirit (Akerlof and Shiller, 2009). While many stories, especially the modern ones, end with the triumph of the hero, they always contain, embedded in their logical conclusion, the moment that reveals the error of trusting magic, in other words the 'reality check'. However, the general public accesses mostly the glorious versions that sell the 'happily ever after' conclusion. Otherwise, who would believe in magic, anyway?

With this in mind we return to the parallel stories of our heroes, the mythological and the asset price ones. As already shown, a bubble and a myth are closely intertwined, and we believe that understanding the elements of the myth can help

us better understand how the collective psyche tolerates and generates asset bubbles (and other misadventures!).

The magic of herding

While this approach describes the distribution of agency within markets and the emergence of the Asset Price's heroic exploit, we are interested in the mechanisms that enable herding.

What is it that brings together these elements in a narrative that drives human actants to engage in specific economic exchanges in different moments of time and space? Bubbles are generated by investment practices that concentrate on one asset or class of assets that attract more and more investors to the point of over-evaluation and subsequent collapse. Investors, or human actants, act on the promise that the Asset Price will continue to rise, that is, that the hero will continue to limitlessly heighten his performance. However, just as in Minsky's theory, one can speculate that what causes the burst is exactly the increased number of actants investing in the same good. Herding behavior accelerates its multiplication and leads to which causes its loss of singularity on the market. How does this come to happen?

Our answer lies in the action of the actants themselves. We believe that excess investment (speculative finance or Ponzi finance in the Minsky framework) in a single asset typically happens in two situations, or a combination of the two:

1. The overall economic state of the investors is very low, and the Asset offers an exit from this extreme situation (the ideal social environment for Ponzi schemes).
2. The promise of the return on investment is very high, creating unrealistic expectations that generate action.

The Asset must also provide the promise of a better future through a simple action. If this sounds like magic, it is because it is magic by the book. It describes a combination of beliefs and actions backed by rituals meant to reduce uncertainty in situations of risk. In his writings Malinowski (1948) analyzes the social function of magic and religion in Trobriand Islands, and extrapolates his observations on Western societies and their specific categories of knowledge, such as science. He clearly shows how ritual and magic intervene in social practices in moments when high risk and high reward are present. Thus, the Trobrianders appeal to magic as meaningful performance when they prepare to take their rafts fishing on the ocean. However, if they fish in a lagoon, the risk is minimal and magic is not necessary.

Contrary to today's practices in financial markets, the same person who performed magic rituals or posed as fishing (or gardening) experts in Trobriand island was very explicit when he (never a she for the Trobrianders) was the expert and when he was the magician. The social function and intimate links between magic, science and religion in our societies have been re-analyzed and extended by Tambiah (1990).

Going back to the Housing crisis, we asked ourselves, what are the elements that concurred with the emergence of the bubble and its magic? In other words, what are the actants that gave agency to the Housing Price (our mythological hero), and how did their combined actions create the crisis? We identified three components of the crisis that correspond with magical thinking and acting:

1. *The belief* - real estate as a good with an infinite potential for growth and that is impossible to devalue, especially in urban areas, as urban global demographics seemed to explode.
2. *The action* - create capital by "refinancing" an already mortgaged asset based on the previously exposed belief.
3. *The ritual* - the creation of Asset-Backed Securities (ABS), and a Collateralized-Debt-Obligations (CDO) market, combined with the increased importance of risk rating and assessment.

Their combination created the necessary momentum for the market to heat up and create the housing bubble. In other words, the human and non-human actants in the hero story converge into the agency of the hero, thus creating its 'magic' powers and promising the enlightened future. As we already saw with Cadmus, heroic journeys are similar in their development, expression of a commonality in the way humans construct narratives. Campbell detected the recurrence of this graph in many if not all heroic stories of antiquity, and presented it in a circular form, as the hero's path. Crucial for our purpose is the moment in which, after a series of exploits, a divine intervention bestows the hero with supernatural powers that both elevate him and allow him to gain people's trust. This trust or belief, lead to more investment of the actants in the powers of the hero. In the following section we concentrate on the dynamic of actants (or variables) and the complex contextual configurations that engender the belief translated in actions that create the hero and amplify its powers to the point of demise. We consider both humans and social dynamics to be actants on markets [16] and creators of the Asset Price's agency, and apply a combination of Campbell's observations with the semiotic analysis of narrative as proposed by Greimas (1966) in his 'actantial model'.

On one hand we have the journey of the hero, represented graphically as the evolution of the Asset Price. On the other hand, we have the complex relationships between actants on the market that confer agency on the hero.

Mapping the myth

As Minsky (1992) theoretically suggests and Reinhart and Rogoff (2010) empirically demonstrate, signs of the crisis and bubble evolution may be mapped out on economic indicators that bear similarity to the history of the economic bubble and burst dynamic. The evolutions and fluctuations are also in direct circular co-generative relation with emotional states experienced by the population engaged in market practices, themselves actants of the Asset Prices' agency.

Regardless how we name the phases, just like the stages of Minsky's credit cycle, the evolution of financial crisis in history is similar over time. It is always a combination of actants and their actions, along with the socio-cultural and historical context that make the bubble exist, become credible, grow, and then dissolve. How is it that this repeatedly happens?

In their historical analysis, Reinhart and Rogoff (2010) identify a series of macro-economic indicators of an early crisis. According to the authors, the indicators not only alert us that crisis is in development, but also show similarities in the development of crisis. They propose that systemic analysis that can offer '[...] valuable information whether an economy is showing one or more of the classic symptoms that emerge before a severe financial illness develops' (Reinhart and Rogoff, 2010: 281). At the same time, the authors identify the reluctance of market actants to acknowledge the incoming crisis as '[...] the well-entrenched tendency of policy makers and market practitioners to treat signals as irrelevant, archaic residuals of an outdated framework, assuming that old rules of valuation do not apply' (idem).

Table 3 is an attempt to identify and map out the elements of the semiotic analysis of myth and the actants in financial bubbles as we know them today. There is much more going on in their dynamic interrelation than a simple rule of variation. What is at play is an old entrenched story-telling habit – it is our mythological minds that organize the development of bubbles and crises. The Asset Price's journey during crises follows the narrative structure of heroic archetypal stories, be they from antiquity or modern times. As humans we are storytelling machines and our social behavior is pegged into the stories we tell about ourselves.

Table 3 Actants and agency in the mythical journey of the Asset Price

Mythical actants and their rationale	Financial Equivalent	Acts/ Effects	Stages of intervention in the Minsky Framework
<p>Hero - Pursues unlimited growth/transcendence</p> <p>Receiver</p>	<p>Asset Price – hero and receiver at the same time.</p>	<p>It cyclically rises and falls. Its agency/subjectivity is a result of the dynamic combination of the actants in the narrative.</p>	<p>Its story of becoming. Present in all five stages of the bubble, it starts to become the hero as it “receives” benefits from the ‘sender’.</p>
<p>Sender(s) – Gods, Powerful King - exercise power to maintain status quo/ peace and prosperity.</p>	<p>Central Banks/ Governments/ Regulators.</p>	<p>Create the conditions for the existence of investments, and bring into existence market value.</p>	<p>While being ubiquitous, its/ their actions are manifest in relation with the hero and its path. They act mostly in the background and become visible only in crucial moments.</p>

Mythical actants and their rationale	Financial Equivalent		Acts/ Effects	Stages of intervention in the Minsky Framework
<p>Helpers – pursue or find themselves in direct association with the hero and gain influence and power. The cow, the serpent (and its teeth), some gods, the magic rituals and their performers, various divine interventions. They enter the story and intervene in different situations.</p>	<p>Market experts and actants – their combined acts create investors' confidence and the feedback effects that increase the power of the hero.</p>	<p>Rating Agencies</p>	<p>Perform the reassuring ritual of risk assessment and rating as elements of the magic.</p>	<p>They become active starting with the second stage, "the boom", and attain their peak of power in stage 3 'euphoria'. Their most important role is to facilitate the passage from boom to euphoria and usually they keep acting euphorically even (or especially) during the profit taking stage, when smart money retreats. According to the evolution of the crisis, they may lose their influence or recede into secondary roles.</p>
		<p>Economic Pundits on CNBC and Bloomberg. Actors on the market who have interests in attracting investments in their city, geographical area, product, etc.</p>	<p>Like oracles or prophets, they create and proclaim the stories of a bright future to believe in (Akerlof and Shiller, 2009).</p>	
		<p>Credit - from the same source as the Debt (an opponent).</p>	<p>The divine intervention bestowed upon the investor to overcome caution/ fear.</p>	
		<p>New Transformative Technology</p>	<p>Another type of divine intervention – it may be a universal answer to all problems in which one has to invest, or a new technology of investment itself.</p>	

Mythical actants and their rationale	Financial Equivalent	Acts/ Effects	Stages of intervention in the Minsky Framework
Object (of desire) – Glory, Princess, The Ring, etc. - exists to be coveted	Market Value		
Opponent(s) – Serpent, Dragon, Demon, Hero's Own Fear or Hesitation – wants to defeat the hero.	Caution – Lack of Confidence	Caution stops investment. Rituals such as risk assessment and protection conducted by financial gurus and magicians combined with stories of success help overcome caution.	Manifest first between stages of boom and euphoria, they are crucial in the creation of the receiver as hero. They reappear in the moment of burst, leading to the hero's demise. For example, debt acts like a divine intervention that gives power to the asset price, and like the final blow, causes its fall.
	Debt/ Interest rates	The hidden trap embedded in slaying the dragon/ overcoming the obstacle with the help of divine intervention.	
Ordinary people – trying to prosper and live in peace in face of the uncertainty of life.	Individual investors – trying to profit in the face of economic uncertainty.	Generally play the role of spectators – they are pulled into the myth usually as helpers/speculators.	Pulled in towards the end of the boom and beginning of euphoria, and are the first victims of panic.

Market behavior and the Asset Price's agency are aggregated from actants out of which human discursive practices occupy an essential role in shaping. Economic goods and exchanges script our behavior as much as we script their evolution, and together we create the framework for the stories of financial bubbles.

Where do the difference lie? Although there is similarity in the framework and development of crisis, there are dissimilarities in the stories themselves, in the language we use to describe and organize our experience, and in the perceptions that we need to account for. Which of these 'differences' are relevant for our scope, and how can we identify them?

Whether stories make sense or not largely depends on the historico-cultural context in which they are told. To understand how stories of different Asset Prices make sense at different moments of crisis, we go back to our analysis of housing bubbles above and try to understand the various commonalities and *contextual* differences that allow a similar pattern to emerge. The most recent crisis, for example, was a crisis based on risk assessments and the capitalization of risk. One must remember that the housing bubble matured and burst in a decade marked from the beginning by the tragic moments of 9/11 in New York, the heart of the financial global system. We pose, by way of speculative thought, the socio-political context of a decade marked by risk and its collateral practices. The threat and risk-related vocabulary and practices spread throughout the entire social body, and for a moment the entire system and lifestyle seemed to collapse. A series of political measures and social practices that targeted risk and its reduction (i.e., the Patriot Act, color coding the risk of terrorist attacks, etc.) were enacted. The story that pervaded the social body was that of an enhanced risk for a second attack on the homeland, its possible reduction, and the need for shelter (house) a universal human need. The shock wave, however, was not felt until six years later as the opportunity to transform threat and risk into a commodity was being rapidly capitalized upon. Buying and selling risk was almost a social need after 9/11.

Our analysis has not examined narratives that took form but did not result in a bubble or crisis. That particular weakness is difficult to fully remove or address. One possible test may be investment strategies based on social signals that can prove the efficacy by generating excess returns. For now we hope that this analytic framework will increase awareness so that when certain narratives begin to spread and achieve mythical proportions, trade volumes increase, and an unsustainable macroeconomic situation arises, we will have a better understanding of what is going on than any one of these indicators alone would give us.

Conclusion: social media, spread of stories and understanding the current myths

Working within Minsky's framework, we showed the human behavior element common to financial crises that renders them endogenous. This same element organizes collective human behavior which itself follows universal narrative structures – or mythologies. We argued that this perspective would allow us to understand both the universality of how crisis occurs and the socio-cultural variance that acts like a smoke screen to make crisis look like the effect of exogenous factors. The socio-cultural and historical difference is what interests us from an applied methodological perspective. No matter how similarly structured, we as humans are more prone to organize and act within the narratives of our time than within those of times past. We may cheer easier for Iron Man than for Hercules, despite the fact that their narratives follow the same structures because the latter is made by Hollywood to look more like a contemporary character.

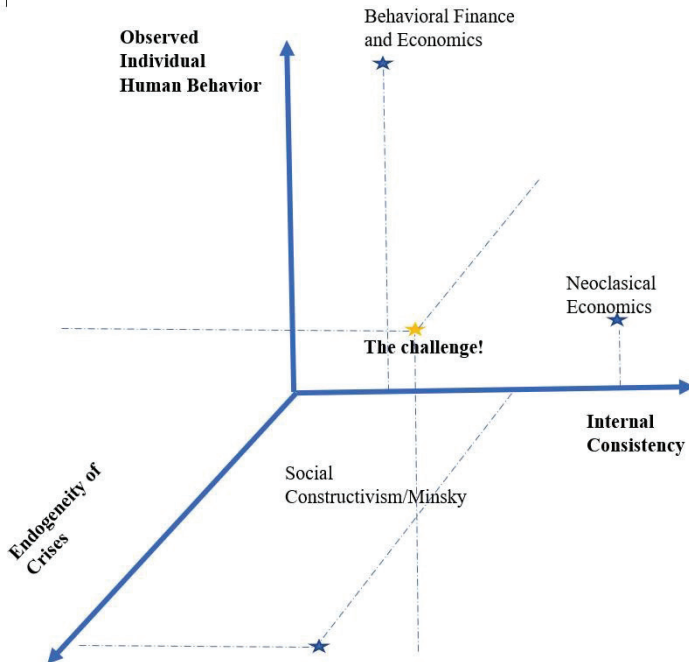
We summarize the various schools' explanations of the financial crises along three dimensions- structure of theory, the ability to include "observed" human behavior, and the degree of endogeneity of a crisis.

Table 4 Various approaches to explaining financial crises summarized

Approach	Structure	Inclusion of Observed Human Behavior	Completeness (Endogeneity of crises)
Rational Economics	Internally consistent mathematical models from micro to macroeconomics. Expected Utility Theory is the main bulwark.	Chiefly recognize desire for higher consumption, risk aversion in a rational framework. Similar to the rational egoism of the formalists.	General Equilibrium approaches. Crises are generally a result of exogenous shocks or a posteriori explanations.
Behavioral Economics	Based on prospect theory and other human behavioral biases.	Emphasis on non-rational choices. Similar to substantivist approach in economic anthropology, it proposes a holistic understanding of human behavior.	Crises are a natural outcome of non-rational or "human choices."

Approach	Structure	Inclusion of Observed Human Behavior	Completeness (Endogeneity of crises)
Social Constructivists/ Post- -Keynesianism	Institutions and regulations that society generates to meet its needs. Financial fragility is inherent.	Individual human behavior is subsumed by societal.	Inherent financial fragility results in inevitable crises. More generally, crises are inevitable built into mechanisms of social change.
This article	Based on mythology as mode of structuring human behavior within the framework of societal needs.	Individual human behavior is structured by myth and its interpretation within the economic and social context. Humans are not the sole actants.	Crises are inevitable because they are products of human mythological thinking and behavior.

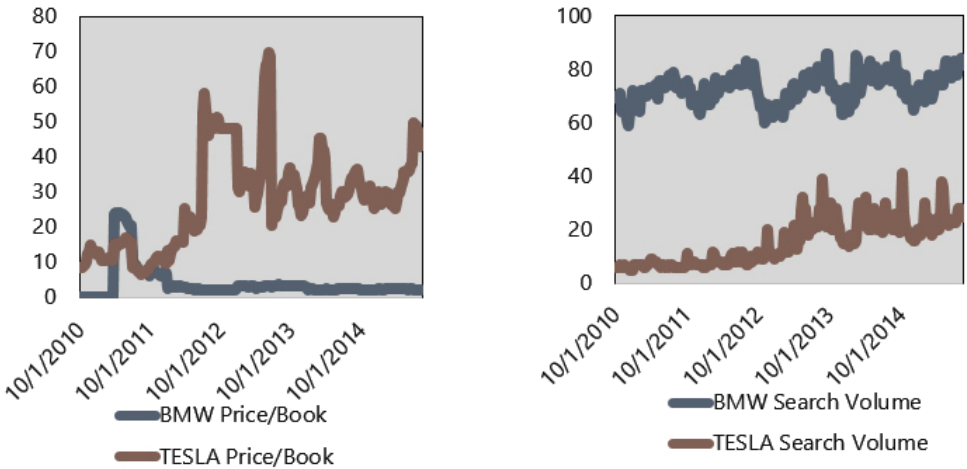
Figure 4 'The challenge!' indicates the type of tridimensional explanation we are working towards



We have shown how paying attention to the current stories being told can help us understand why not all asset prices provoke bubbles. Our analysis proposes new ways of understanding the present, and perhaps marginally improving forecasting the future of markets by increased attention to any current cultural lexicon pertaining to market and finance. The proliferation of social media puts the narratives of societies at our finger tips. Are there certain signs in the environment about the actants' (human) beliefs as reflected in their language that can guide us towards specific identification of an economic crisis stages?

The digital age has made stories easier to collect in terms of data. In fact it transforms stories into data and can be mined in order to identify the weak signals of an emerging vocabulary, both in terms of frequency and of relevance. We can look at social media and have access to how stories spread, in what context, and the kinds of stories that are being reported or deemed to be important. This is a complement to the news media that establishes which stories will be told to the population. Social media analysis may map out emerging lexicons that may inform the creation of the new mythical Asset Price. For example our decade is marked by climate change related stories, from alternative energy industry to carbon emissions markets. Will the climate change related economic activity generate the next Asset Price Hero? We do not know, but we could launch an analysis of the lexicon and its spread. This analysis would include a series of cultural variables that may indicate how a certain stock commodity would interact with local values, because a certain type of magic works only if the cultural soil is fertile for it.

Figure 5 TESLA vs. BMW valuation (left) and search volume (right)



Source: Bloomberg and Google trends (trends.google.com)

As an example of the climate change analysis we look at the stock Tesla (TSLA). TSLA's Price to Book ratio [17] is 43 as compared to other car manufacturers such as General Motors (GM) with a Price to Book ratio at 1.4, BMW at 1.5, and Ford (F) at 1.7 [18]. (Figure 4) What type of reality this value reflect? In what phase of the journey does our hero finds itself this time? What generates the level of confidence that make investors overcome their uncertainty? As we can see in figure 7, TSLA has a substantially higher and more volatile valuation multiple than BMW and this valuation has been increasing in recent years. BMW is both a more established brand and is also more popular amongst people searching for cars – at least based on the number of searches. However, the number of searches for TSLA is increasing. We also note that there is a much higher simple correlation between TSLA searches and increases in valuation (48%) vs. BMW (14%) [19].

In terms of media coverage and importance Elon Musk is at the peak of his powers but some problems have been cropping up with a Financial Times article on the 18th of September, 2018, reporting that 'Tesla needs cash, says Morgan Stanley' (Financial Times, 2018).

After a series of tweets on August 7, 2018 in which Elon Musk suggested plans to go private - where perhaps the 'smart' money might retreat, leaving die-hard believers holding the stock at \$420 a share, which was a substantial premium to the existing stock price, SEC sued him for securities fraud since the potential transaction was 'uncertain and subject to numerous contingencies' not disclosed. Finally, the case was settled on September 29, 2018 with TSLA and Musk agreeing to pay \$40 million in penalties and Musk having to step down as Tesla's chairman. The SEC also announced its intention to distribute the money obtained via those penalties to 'harmed investors.' (US Security and Exchange Commission Press Release, 2018)

In the context of the framework presented in the article, if we examine the 'story' of TSLA and its founder Elon Musk, a provocative question is if SEC playing a role similar to one played by Mars in the mythical outline, with the investors as the constituency of SEC similar to Mars' favorite serpent. However, TSLA soldiers on because the quest is no less than planetary salvation, and the investors are true believers. In a recent Financial Times article Philip Delves Broughton (2015) suggests that human calculations are extraneous to rational economic analysis of potential revenues: 'You do not buy Tesla because you think you know what profits it will make. You buy the stock because you think some new technology such as Tesla's will change the world in ways that invalidate any such estimate.' (Broughton 2015). Our thinking points out to this type of rationale and beyond. When humans are searching for a brand or product, they are searching for something more than the functionality and prestige that the product may offer. They are searching for meaningful answers to their questions. In this logic, one must keep in mind that TSLA embodies the dreams of future clean energy and elegant mobility. It is not a vehicle of the future but a vehicle that will take us into the future, today when our major worry is that our future is jeopardized by our very economic activity on the planet. Is TSLA the promise of business as usual in an era when we think that there will be no more business to talk about in the first place?

To answer, one must look closely at the aggregate of actants, human and non-human, currently present and influencing the context of trade. This is certainly possible today, when social media and the digitization of everything offer the necessary data for a complementary quantitative and qualitative analysis of the market. Mapping our culturally dependent and yet universal narratives, together with macroeconomic and asset valuation data opens the door to a deeper awareness of how financial markets operate. At the same time, we are under no illusion of becoming the oracle. After all, these stories are the creation of our collective ego that we cannot altogether escape.

Endnotes

- [1] 'Crash Course. The Origins of the Financial Crisis' in *The Economist* Sep 7, 2013. 'Moreover, Europe had its own internal imbalances that proved just as significant as those between America and China. [...] The Fed made no attempt to stem the housing bubble. The European Central Bank did nothing to restrain the credit surge on the periphery, believing (wrongly) that current-account imbalances did not matter in a monetary union. The Bank of England, having lost control over banking supervision when it was made independent in 1997, took a mistakenly narrow view of its responsibility to maintain financial stability.'
- [2] Widmaier et al. (2007) extend the understanding of endogenous factors that lead to social crisis in general, be they wars or financial melt downs, and identify the necessity of change as a "built-in" structural mechanism that triggers them.
- [3] Reinhart and Rogoff (2010) elegantly refute the argument of difference in their book *This Time is Different. Eight Centuries of Financial Folly*, likening the cyclical financial crashes to rites of passage that both emerging and developed market economies pass through.
- [4] For example Thaler and Sunstein (2008) are critical of the homo-economicus view of human beings and note that research raises 'serious questions about the rationality of many judgments and decisions that people make.' (pp.6-7)
- [5] See Bruno Latour (1987), Donna Haraway (1991), Michel Callon (1986, 2005), or Timothy Mitchell (2002) for the development and application of actor-network theories of distributed agency.
- [6] 'Stock market surges back, Dow rallies 619 points' is the headline in a report by Anthony Mason, Aug 26, 2015 at www.cbsnews.com. This is an example of how stock market seems to have agency.
- [7] The degree of generality of the story-telling behavior can be analyzed and disputed. We are aware that we use this generalization as a postulate rather than an affirmation that needs demonstration.
- [8] Ellis (1998) suggests that the 1978 Supreme court decision in case of *Marquette National Bank of Minneapolis v. First Omaha Service Corp* fundamentally changed the availability of credit and increased the risk profile of borrowers across United States as various states deregulated the interest rates and other banking functions.

[9] Levitin and Watcher (2012) provide a brief overview of the theories while focusing on the lack of government regulation resulting in private label securitization (PLS).

[10] Mian and Sufi (2008) also show that there was a rapid acceleration of mortgage debt from 2002 to 2005 (14.5% vs. 5.8%).

[11] The default rates increased by about 3.5% on average from 1996, which was 1.5 standard deviations or \$350 billion increase in defaults (Mian and Sufi, 2008).

[12] \$144.5 billion was withdrawn from money markets in one week vs. \$7.1 billion the week prior (Geithner, 2008).

[13] We plea the reader to indulge in the metaphor of mythical time. The timeline of the housing bubble does not juxtapose year per year that of the mythical Cadmus' life. However, the sequence of events is similar.

[14] We plea the reader to indulge in the metaphor of mythical time. The timeline of the housing bubble does not juxtapose year per year that of the mythical Cadmus' life. However, the sequence of events is similar.

[15] As Joseph Campbell states in the opening page of his book: '[...] Myth is the secret opening through which the inexhaustible energies of the cosmos pour into the human cultural manifestation. Religions, philosophies, arts, the social forms of the primitive and historic man, prime discoveries in science and technology, the very dreams that blister sleep, boil up from the basic, magic ring of myth.' (Campbell, 2008 [1949], p.1)

[16] The vision of markets as computational systems engaging an enormous variety of factors is common in sociological analysis of markets (MacKenzie, 2011, Callon M. and Muniesa, F. 2003), and so are the attempts to build the link between more often than not mutually exclusive qualitative and quantitative approaches on economic behavior.

[17] Price to book ratio indicates the market value of an asset compared to its accounting or book value. If the ratio is high, the market assumes the potential for future growth is much higher.

[18] Source Bloomberg.

[19] This raw correlation is for levels and has not been corrected for seasonality of search queries. This is just trying to make a simple point. Because of the normalizing of searches and the belief that Price to Book ratios shouldn't explode to infinity 'in normal circumstances' we are reporting this.

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