Abstract

Why do asset prices move so frequently and why is the volatility so high? Why do prices move at all? This is obviously a fundamental question in theoretical economics and quantitative finance, that encompasses other, related issues: what is the information reflected by prices, and to what extent market prices reflect the underlying economic reality? Do we understand the origin of crises and crashes?

1. Main text

In my contribution [1], I have reviewed the evidence that the erratic dynamics of markets is to a large extent of endogenous origin, i.e. determined by the trading activity itself and not due to the rational processing of exogenous news. Volatility is well known to be much too high to be explained by changes in fundamentals, and most large price swings seem to be unrelated to relevant news release. This was the conclusion reached in [2], which we have recently confirmed in detail, using high frequency data [3]. Another striking observation, that could be naturally accounted for if price movements do result from the endogenous dynamics of a complex system, is the universality of many empirical stylised facts, such as the Pareto tail of the distribution of returns, or the intermittent, long memory nature of the volatility. These features are observed across the board, on all traded liquid assets, and are quantitatively very similar, suggesting that these tails are not generated by strong exogenous shocks, but rather by the trading activity itself, more or less independently of the nature of the traded asset. The activity and volatility of markets have a strongly intermittent dynamics: quiescent periods are intertwined with bursts of activity, on all time scales. Interestingly, many “complex” physical systems display very similar intermittent dynamics: earthquakes, solar eruptions, velocity fluctuations in turbulent flows, avalanche dynamics in random magnets under a slowly varying external field [4], teetering progression of cracks in a slowly strained disordered material, etc. The crucial point about all these examples is that while the exogenous driving force is regular and steady, the resulting endogenous dynamics is complex and jittery. These systems find a temporary equilibrium where activity is low, before reaching a tipping point where avalanches develop, until a new quasi-equilibrium is found – sometimes close to the previous one, sometimes very far. In financial markets, the flow of “real” news is of course needed to stir the activity, but the scenario we favour is similar: it is the response of the market that creates turbulence, and not necessarily the cause, barring of course exceptional events that do sometimes severely disrupt markets (for example, Lehman’s bankruptcy). In order to understand why and how prices move, the joint fluctuations of order flow and liquidity – and the way these impact prices – become the key ingredients. Impact is necessary for private information to be reflected in prices, but by the same token, random fluctuations in order flow necessarily contribute to the volatility of markets. Our thesis is that the latter contribution is in fact dominant, resulting
in a decoupling between prices and fundamental values, at least on short to medium time scales. Markets operate in a regime of vanishing revealed liquidity, but large latent liquidity, which explains their hyper-sensitivity to fluctuations and to unstable feedback loops. We believe that the formal limit of zero liquidity is a critical point, which would naturally explain the analogy between the dynamics of markets and that of other complex systems, in particular the universal tails and the intermittent bursts of activity. We are however lacking a precise model that would allow one to formalise these ideas (see [5,6] for work in that direction).


Other ideas are worth mentioning:

• Collective effects mediated by imitation or contagion pervade markets and lead to instabilities. Prosperity relies heavily on trust, which is an immaterial common good that has no inertia and can dissipate overnight. The most efficient mechanism for contagion is through the dynamics of the price and of the order flow, which is public, common information. Since it is impossible to be immediately sure that a silly trade is indeed silly, its impact on the price can trigger an instability, as was likely the case during the flash crash of May 6th 2010. Being influenced by the behaviour of others seems to be one of the most common human traits, that persists across history. We are always worried that others may be smarter, or may have more information than we do. This imitation propensity is well known to lead to dramatic effects (see e.g. [7,8] and refs. therein), and must be one of the ingredients leading to crises and crashes. The importance of hysteresis, in that respect, cannot be overemphasized.

• Another important idea is that agents in financial markets are strongly heterogeneous. Physical systems where individual elements are both heterogeneous and strongly interacting are well known to be inherently fragile to small perturbations. These systems generically evolve in an intermittent way, with a succession of rather stable epochs punctuated by rapid, unpredictable changes – again, even when the exogenous drive is smooth and steady. Within this metaphor of markets, competition and complexity could be the essential cause of their endogenous instability. The main problem with the current theories is that they are based on the idea that we can replace an ensemble of heterogeneous and interacting agents by a unique representative one, in other words that the micro- and macro-behaviour should coincide [9]. Within this framework, crises are expected to require a major external shock, whereas in reality small local disturbances can trigger large systemic effects.

• Finally, there are a number of explicit destabilising feedback loops that regulators should investigate and abate. Some are a direct consequence of the faith in the efficiency of markets, such as the “mark-to-market” accounting rule, which relies on the idea that market prices are fair and unbiased. Such a pro-cyclical practice applied on credit derivatives has contributed to impair the balance sheet of many financial institutions in 2008, and amplified the mayhem. In our opinion, again, the “fair price” idea does not make sense without at least the notion of an intrinsic uncertainty and a liquidity discount based on a pessimistic estimate of the impact cost during a fire-sale. Other feedback loops are created by the use of financial derivatives and/or by quantitative models themselves – a vivid example is the crash of 1987 that was a direct consequence of the unwarranted trust in Black-Scholes’ perfect replication theory.

References