

Efficient Market Hypothesis: What are we talking about?

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Abstract: The “efficient market hypothesis” is omnipresent in theoretical finance. A paper published by Eugene Fama in 1970 is supposed to define it. But it doesn't, and this leaves the door open to different interpretations of the “hypothesis”, causing lots of confusion. Only ideological reasons – efficiency is a very sensitive question in economies – can explain why scholars continue to refer to this meaningless “hypothesis”.

In 1978, Arthur Jensen, a Harvard professor, famously wrote,

I believe there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Market Hypothesis.

Probably few people agree nowadays with Jensen: how, after the 2008 global economic crisis, can someone claim that there is a “solid empirical basis” for the proposition that markets are “efficient”? Although in recent years finance has become much more important (as a percentage of GDP and profits) and complex, the social system in those years has not changed radically. And aren't financial collapses, recessions and depressions “empirical evidence” and as old as capitalism?

Of course Jensen has in mind another set of evidence when he claims that the efficient market hypothesis (EMH) has a “solid empirical” basis. So the question is: what is the exact meaning of the EMH and what kind of data is used to test it?

The usual answer given by academic papers and textbooks to this question is to refer to the most quoted article in financial economics: “Efficient Capital Markets: a Review of Theory and Empirical Work”, published in 1970 by Eugene Fama in *The Journal of Finance*. It seems, thus, that the EMH was born – or at least acquired its ultimate and uncontroversial shape – in 1970. However, Fama's paper presents itself as a “Review of Theory” – that is, a review of a theory (or of theories) which existed before 1970. Long before, according to the English Wikipedia (03/2011):

the efficient-market hypothesis was first expressed by [Louis Bachelier](#), a French mathematician, in his 1900 dissertation, ‘The Theory of Speculation’ (http://en.wikipedia.org/wiki/Efficient-market_hypothesis).

And even much longer before according to the webpage “Efficient Market Hypothesis: History” (<http://www.e-m-h.org/history.html>); it traces the EMH back to 1565! There is plenty of information about financial theory and its evolution on this webpage. But, at the same time, it alludes to so many phenomena – Brownian motion, random walk, autocorrelation, martingale, leptokurtic distribution, arbitrage, market rationality, rational expectations, excess volatility, abnormal returns, etc. – that in fact the message it tries to deliver turns quite unintelligible.

Anyway, because Fama's 1970 paper is presented by this webpage as “the definitive paper on the efficient markets hypothesis”, we will give it special attention.

About Fama's "definitive paper on the efficient markets hypothesis"

Fama starts his paper by evoking "economy's capital stock" and "ideal markets" where the resource allocation process is the result of "production-investment decisions [made] under the assumptions that security prices at any time 'fully reflect' all available information". Right after these allusions to a real economy, Fama enunciates the sentence commonly presented as the definition of an efficient market:

A market in which prices at any time "fully reflect" available information is called "efficient" (Fama, 1970, p 383)

Fama is more cautious than his followers: unlike them, he avoids the word "definition" or any equivalent expression. He is aware that a sentence which includes the undefined, vague expression "fully reflect" can hardly be given as a definition – something stressed by the use of the quotation marks. By the way, it is rather astonishing that the most quoted paper in financial economics uses quotations marks to characterize the concept that brought him fame¹!

All through the paper, Fama uses (fifteen times!) quotation marks for the expression "fully reflect". He is, of course, aware that such a fuzzy phrase cannot be used for empirical work:

the definitional statement that in an efficient market prices "fully reflect" available information is so general that it has no empirically testable implications (p 384).

But he cannot remain "so general", as one of his tasks is to "review empirical work". Thus, in part II of the paper ("The Theory of Efficient Markets") he proposes theories with "testable implications". The first three subpart titles (A. *Expected Returns or "Fair Game" Models*, B. *The Submartingale Models* and C, *The Random Walk Model*) suggest that at least three different models (or theories) can be associated to the "fully reflect" expression². Those models differ in some aspects – for instance, martingale or sub-martingale, are less restrictive than random walk³ – but they all imply that past and present information cannot be used

to predict the future in a way which makes expected profits greater than they would be under a naive buy-and-hold model (p 391).

In popular language, "fully reflect" means here that, in general, nobody – even professional investors – can "beat the market". Capital markets are "efficient" if they behave as "fair games", where "*The mathematical expectation of the speculator is zero*" (Bachelier).

The fair game hypothesis has two aspects: no arbitrage opportunity and unpredictability of security price variations. Empirical tests can then ascertain whether arbitrage opportunities existed in the past or not and whether information extracted from past data on security prices – serial correlations, linear dependencies or more complicated patterns on the data – could have been used to correctly predict price fluctuations. Alfred

¹ Usually, papers and books in finance (including the EMH entry of *The New Palgrave Dictionary of Economics*) do not use quotations marks for "fully reflect", suggesting that everybody knows what this expression means.

² The different models are somewhat related to Fama's distinction between "weak", "semi-strong" and "strong" forms of efficiency, but the link with these models is not obvious. Do they all "fully reflect" or some "reflect more or less" than others?

³

Large daily changes tend to be followed by large daily prices. The signs of the successor changes are apparently random ... which indicates that the phenomenon represents a denial of the random walk model but not of the market efficiency hypothesis (p 396).
Successive random changes of signs are a typical propriety of martingales.

Cowles provided in the thirties “empirical evidence” in favor of the “Fair Game” hypothesis: randomly selected portfolios or unmanaged indices do as well or better than professionally managed portfolios after expenses. Subsequent evidence largely confirmed this hypothesis (see, for instance, Malkiel, 2003)⁴.

The remainder of Fama’s paper is dedicated to the review of “The Evidence”. He reviews tests in “random walk literature” (serial dependency, normally distributed price changes, etc.) and “of martingale models” (“Splits and the Adjustment of Stock Prices to New Information”, impact of “Public Announcements” and of “monopolist access to some information”).

One of Fama’s main conclusions is that:

at this date the weight of the empirical evidence is such that economists would generally agree that whatever dependence exists in series of historical returns cannot be used to make profitable predictions of the future (p 399).

So, there is nothing new in the 1970 paper – except omnipresence of the word “efficiency”, in relation to the fair game idea. However, the choice of this word – and of the expression “efficient market” – is not accidental; a scrutiny of Fama’s papers shows that it appears in them both before and after 1970.

From “intrinsic value” to the “joint hypothesis”

According to the e-m-h history webpage, in his PhD thesis (1965),

Fama defines an “efficient” market for the first time, in his landmark empirical analysis of stock market prices that concluded that they follow a random walk.

So, already in 1965, Fama associated “efficiency” with random walk⁵. But he then went further. In a paper, “Random Walk in Stock Market Prices”, published in the *Financial Analysis Journal*, a non-academic review, he explains that

in an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that had already occurred and on events which, as of now, the market expects to take place in the future. *In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value.* (Fama, 1965, p 76, our italics)

Then, “in other words”, efficiency means not only that security’ prices “random walk”, but that they wander around their “intrinsic value”. Fama does not define this “value”. He only explains that, “in the terms of the economist”, intrinsic value is an “equilibrium price”, which “depends on the earning potential of the security”. This earning potential depends in turn on “fundamental factors as quality of management, outlook for the industry and the economy, etc.” – that is, factors in relation with the real economy. In 1965, Fama’s point of view was, thus, not very different from that of fundamentalists. He only added that “the many intelligent traders ... neutralize [any] systematic behavior” of security prices toward their intrinsic values

⁴ In this paper, Malkiel explains that he “will use as a definition of efficient financial markets that such markets do not allow investors to earn above-average returns without accepting above-average risks” (p 60).

⁵ As the e-m-h history webpage remarks, at the same moment, 1965, “Samuelson (correctly) focused on the concept of a *martingale*, rather than a random walk”. In his “definitive paper” (1970), Fama agrees with him.

so that “uncertainty concerning intrinsic values will remain” and actual prices will “wander randomly” – that is, in unpredictable ways.

Turning now to the “definitive” 1970 paper we observe that any reference to intrinsic value or to anything similar has disappeared. But, as we will see, a significant flaw in this paper will in turn prompt Fama to return to the idea of intrinsic value – or, “in the terms of the economist”, to the idea of “equilibrium price” – although with different words.

Stephen LeRoy was the first to point to the flaw: in a paper published in 1973, he remarked that the equation supposed to characterize “market efficiency” is a tautology⁶ (LeRoy, 1976). It is quite surprising that the most often quoted papers in financial economics has such a flaw – and that referees didn’t see it! In a “reply” to LeRoy, Fama admits that since the publication of the “Efficient Markets” review paper, many readers have commented that they find the discussion of the theory misleading or at least difficult to follow...When [such judgments] are made by knowledgeable scholars like Stephen F. LeRoy, the author is forced to agree (Fama, 1976a, p 143).

Rather than defending the presentation of the EMH in his 1970 paper, he proposes to “present the model in a different way” which consists in introducing a new concept, the “true” expected price of a security, different from its market “assessed” value. “True” refers to values in a “model of equilibrium” – in the same way that intrinsic value is the equilibrium price, “in the terms of the economist”.

An efficient market is now such that

the true expected return on any security is equal to its equilibrium expected value which is also the market’s assessment of its expected value (*ibid*).

“True” expected return takes here the place of “fully reflect”. Fama makes no mention in his paper to the “intrinsic value”, but there is an obvious link between securities’ “true” prices, given by “the model of equilibrium”, and their “intrinsic” value.

As only “assessed values” are observed and as, with the new presentation of efficiency, “tests must be based on a model of equilibrium” it follows that “any test is a joint test of efficiency and of the model of equilibrium”.

Now, “joint tests” means that the theory is not falsifiable: if the data doesn’t fit with the “efficiency” hypothesis – whatever it is – there is always the possibility to accuse the underlying “model of equilibrium” of not being the appropriate one. LeRoy’s article “Efficient Capital Markets” in the *Journal of Economic literature* (1989) summarizes the situation:

The failure of many financial economists to appreciate the extent of the gulf separating market efficiency interpreted as economic equilibrium and market efficiency interpreted as the martingale model has led them to vacillate between viewing market efficiency, on one hand, as hard-wired into their intellectual capital and unfalsifiable and, on the other hand, as consisting of a specific class of falsifiable models of asset prices... This is most evident in Fama’s (1970) discussion, where market efficiency was described as a substantive theory generating falsifiable

⁶ Fama’s equation $E(p_{j,t+1}^{\sim}|\Phi_t) = [1 + E(r_{j,t+1}^{\sim}|\Phi_t)]p_{j,t}$ – where $p_{j,t+1}^{\sim}$ and $r_{j,t+1}^{\sim}$ are price and return values in $t+1$ anticipated in t and Φ_t , the « information set » – is *always true* as, by definition, $r_{j,t+1}^{\sim} = (p_{j,t+1}^{\sim} - p_{j,t})/p_{j,t}$ (the expectation operator $E(\cdot|\Phi_t)$ being linear).

predictions, but where at the same time the mathematical formulation of the market was tautologous (LeRoy, 1989, p 1592).

Fama's 1970 paper made no allusions to "true" laws (or returns) and to "joint hypothesis". It generates falsifiable predictions – about securities prices patterns, professional *versus* index randomly selected portfolios average gains, etc. – following the tradition of Bachelier, Cowles, Kendall, Samuelson and others. After his "reply" to LeRoy, Fama kept on defending, in fact, the "fair game" version of the EMH, essentially on an empirical ground. For instance, when in 2010 a journalist of *The New Yorker* asked him: "the fundamental insight of the efficient market hypothesis [is] that you can't beat the market?" he answers without hesitation "Right—that's the practical insight. No matter what research gets done, that one always looks good"

<http://www.newyorker.com/online/blogs/johncassidy/2010/01/interview-with-eugene-fama.html#ixzz1CE5FaKqK>.

Now, it is not harmless to replace "beat the market" by "market efficiency". For economists "efficiency" has a precise meaning: Pareto optimality. That is, a propriety of resources' allocation which has little to do with stock markets and speculation. On the contrary, there is a close relation between Pareto optimality and general competitive equilibrium (through the two Welfare Theorems); it seems then natural to put forward this particular "model of equilibrium" – as it is suggested by Fama himself at the beginning of his 1970's paper. With, as a result, even more confusion.

From "model of equilibrium" to "fundamental value".

The first critics of the 1973 version of EMH – which distinguish between the "assessed" and the "true" value of a security – came from scholars such as Robert Shiller, who pointed to the statistically significant difference of volatility between stocks prices (their "assessed" value) and real variables related to their "true" value – e.g. dividends. To quote the e-m-h history webpage, the stock market does exhibit "excess volatility". The measure of the "excess" depends on the "model of equilibrium" variables chosen. The "fundamental value" of a firm – *i.e.* the present discounted value of its expected future payoffs⁷ - is one of the most popular of these variables.

A quotation from Shiller, one of the initiators of the "excess volatility" thesis, gives a good example of the shift in the EMH interpretation:

the efficient markets theory reached its height of dominance in academic circles around the 1970s. At that time, the rational expectations revolution in economic theory was in its first blush of enthusiasm ... The idea that speculative asset prices such as stock prices always incorporate the best information about fundamental values and that prices change only because of good, sensible information meshed very well with the theoretical trends of the time (Shiller, 2003, p 83).

The (fuzzy) idea that "prices 'fully reflect' all available information" is replaced by the (fuzzy) idea that "prices always incorporate the best information about fundamental values".

Also, when Shiller explains that

⁷ The discount factor is sometimes deduced from the "representative agent" marginal rate of substitution in a "dynamic general equilibrium" model (cf. Grossman and Shiller, 1981). This kind of "model of equilibrium" was first proposed by Robert Lucas (more on that later).

the anomaly represented by the notion of excess volatility seems much more troubling for efficiency markets theory than some other financial anomalies, such as January effect or the day-of-weak-effect (*ibid*, p 84),

he mixes up two different interpretations of the EMH: the “fair game” one – the January effect or the day-of-weak-effect are “anomalies” as they imply that the past can help predict the future – and the “stock prices give a good estimation of firms fundamental value” one.

There are hundreds of papers – popular and academic – where these two interpretations of EMH are mixed, or confused. For instance, here is what a paper recently published in this journal said:

The efficient market hypothesis ... [states] that asset prices fully reflect [without quotations marks, OG] all available information. This excludes the possibility that trading systems such as the stock market “based only on current available information ... have expected profits or returns in excess of equilibrium expected profit or return” (Fama, 1970, p. 384)... *Prices are equal to their fundamental value* and thus investors receive what they pay for ... In terms of market applications this would suggest that an investor would have *no capacity of beating the market in a persistent way*, and that investing in index funds would be as good as any other strategy [our italics]

[<http://www.paecon.net/PAEReview/issue52/CaldenteyVernengo52.pdf>, pp. 77-71).

Or, again:

In [an efficient market] *there are no arbitrage opportunities* and *the prices must equal to the present discounted value* of expected future payoffs over the asset’s life (EMH) (our italics, p. 73).⁸

Fama’s discussion of the efficient market hypothesis was – at least during the seventies and eighties – vague and fluctuating enough to allow many interpretations⁹. This cannot be said of the theories “reviewed” by Fama in his 1970 paper, in particular of Samuelson’s.

Samuelson: not guilty

Paul Anthony Samuelson is often introduced as the father of the efficient markets hypothesis. For example, on the “e-m-h history” website:

Samuelson provided the first formal economic argument for ‘efficient markets’. His contribution is neatly summarized by the title of his article: “Proof that Properly Anticipated Prices Fluctuate Randomly”. He (correctly) focused on the concept of a *martingale*, rather than a random walk (as in Fama (1965)).

⁸ This sentence is in a paragraph about “the Arrow-Debreu notion of efficiency”. But Fama never refers to this notion when he “defines” market efficiency: it is a long way between “fully reflect” and Pareto-optimality!

⁹ In his textbook, *Foundations of Finance* (1976), he explains:

An efficient capital market is an important component of a capitalist system. In such a system, the ideal is a market where prices are accurate signals for capital allocation. That is, when firms issue securities to finance their activities, they can expect to get ‘fair prices’ and ... investor choose the securities under the assumption that they pay “fair” prices. In short, if the capital market is to function smoothly in allocating resources, prices must be good indicators of value (Fama, 1976b).

“Fair price” (or “value”) replace “intrinsic price”. But it has nothing to do with the “fair game” idea.

Of course, Samuelson does not use the term “efficient markets”, or even the word “efficient” (or “efficiency”). He deduces from the two following “basic assumptions”:

1. There is a “posited probability distribution for any future price, whose form depends solely on the number of periods ahead over which we are trying to forecast prices”
2. “A futures price is to be set by competitive bidding at the now-expected level”, his “basic theorem” (*Theorem of Fair-Game Future prices*):

There is no way of making an expected profit by extrapolating past changes in the future price, by chart or any other esoteric devices of magic or mathematics (Samuelson, 1965, p 44).

Or, in other words:

The market quotation in t already contains in itself all that can be known about the future and in that sense has discounted future contingencies as much as it is humanly possible (*ibid*).

It is true that this last sentence has a kind of Fama-like flavor, but there is no expression between quotations marks or reference to any of sort of “efficiency”. Above all, Samuelson carefully warns that:

One should not read too much into the established theorem. It does not prove that actual competitive markets work well. It does not say that speculation is a good thing or that randomness of price changes would be a good thing. It does not prove that anyone who makes money in speculation is *ipso facto* deserving of the gain or even that he has accomplished something good for society or for anyone but himself (*ibid*, p 48).

It seems as if Samuelson tried, without success, to prevent what was going to happen five years later, when Fama established a link between his result and “market efficiency”. He is also cautious about the significance of the “posited probability distributions for futures price”, his theorem’s main assumption:

I have not here discussed what the basic probability distributions are supposed to come from. In whose mind are they *ex ante*? Is there any *ex post* validation of them? Are they supposed to belong to the market as a whole? And what does that mean? Are they supposed to belong to the “representative individual”, and who is he? Are there some defensible or necessitous compromises of divergent anticipations patterns? Do price quotations somehow produce a Pareto-optimal configuration of *ex ante* subjective probabilities? This paper has not attempted to pronounce on these interesting questions (*ibid*, p 48-49)

Quite some questions...

Samuelson’s principal merit is to prove that the “fair game” result does not depend on “posited probability distribution” for futures prices. In particular, the sequence of futures prices quoted “today” does not need to be Gaussian or the sequences of futures prices do not need to perform a Brownian motion (or a random walk). “Bubbles” can develop – whatever is meant by that –, provided that they are incorporated in the “posited” probability distribution. The price sequences may contain statistical dependencies, though it is not possible to deduce from past variations the sense and intensity of their variation tomorrow. Stock prices “fluctuate randomly”, in Samuelson words. And that’s it¹⁰.

¹⁰ In a paper published in 1973, “Proof that properly discounted present values of assets vibrate randomly”, Samuelson extends his result to present values of assets, but he carefully omits to refer to the fundamental value and, of course, to “market efficiency” (Samuelson, 1973).

Ideology

According to Bradford DeLong,

a failure to distinguish between the no-free-lunch and the price-is-right versions of the efficient market hypothesis has been the source of a great deal of very bad economics over the past generation (<http://delong.typepad.com/sdj/2009/07/two-efficient-market-hypotheses.html>).

“No-free-lunch” can be taken as synonymous with “fair game” and “price-is-right” with “prices give a good estimation of fundamental value”.

Now, how is it possible that “a generation” of economists has failed to make this major and obvious distinction and that the idea of an “efficient market hypothesis” was so easily established in the 1970’s and is still accepted – both by its defenders and its critics¹¹?

Only ideology – strong *a priori* beliefs – and circumstances can explain Fama’s decision to term the “old” Bachelier-Samuelson no-free-lunch theory “efficient market hypothesis”. In 1970, Fama was professor at the University of Chicago, where the “new classical macroeconomy” was elaborated on the postulate that an economy is always – thanks to “rational expectations” – in competitive equilibrium. Efficient resource allocations (that is, Pareto optimality) results from this postulate – at least if “market failures” are excluded. Contrary to the old “monetarist” (Friedman) tradition, external shocks – even those provoked by government’ discretionary actions – are not supposed to generate inefficiencies. Agents can be (temporary) fooled, but they always realize their optimal plan. Markets became a sort of *deus ex machina* which instantaneously (re)allocates resources in an efficient way¹². In a nutshell, they are “efficient”. That is a postulate, an *a priori belief*, not a (testable) result.

Fama and the new classical macroeconomists typically use the same vocabulary. For instance, in his famous article “Expectations and the neutrality of money”, Robert Lucas talks of “the *true* probability of prices” and explains that “the current value of x is *fully revealed* to traders by the equilibrium price” (our italics). Contrary to Fama, Lucas does not use quotations marks when using the expression “fully revealed”, as he give it a precise meaning: x can be deduced from the price through the one-to-one relation $p = f(x)$ (where agents know function $f(\cdot)$). Also, by “true probability of prices”, Lucas means the actual probability when expectations are self-fulfilling (“rational”). When he notices that

the assumption that traders use the correct conditional distribution in forming expectations, together with the assumption that all exchanges take place at the market clearing price, implies that markets in this economy are *efficient* (Lucas, 1972, p10, footnote 7),

he establishes a clear link between efficiency and resource allocation in a competitive equilibrium (with market clearing price and “correct expectations” – that is, self-fulfilling).

¹¹ Even Samuelson in the last editions of his *Economics* discusses the EMH – while he explains in a footnote that “efficiency” doesn’t mean that the maximum of outputs are produced but that “information is rapidly incorporated”.

¹² “We ... assume that the actual and anticipated prices have the same probability distribution, or that price expectations are rational. Thus *we surrender, in advance, any hope of shedding light on the process by which firms translate current information into price forecasts*” (Lucas and Prescott, 1971, our italics).

Likewise, when he explains in his 1978 paper “Asset Prices in an Exchange Economy” that

the analysis is conducted under the assumption that, in Fama’s terms, prices “fully reflect all available information” (Lucas, 1978, p 1429),

he means that agents can deduce hidden information from prices (and act on the basis of this information to generate these prices¹³). This deduction is rendered possible because the model is reduced to the intertemporal choice of a “representative agent”, who knows the transition function that governs an “entirely exogenous” production process and behaves as a price taker. Very little information is needed – at least in the self-fulfilling equilibrium.

The representative agent intertemporal choice is often taken as the “model of equilibrium” in the “deviations from fundamental value” version of the EMH. Besides, in their 1981 paper, Grossmann and Shiller take the 1978 Lucas model as point of departure to prove “empirically” the “excess volatility” of stock prices – compared to discounted value of a firm’s lifetime dividends¹⁴.

In summary, only ideology – in this case, the indisputable beliefs prevailing in Chicago University in the seventies and after – explains how Fama could transplant without real opposition the concept of efficiency from the world of good’s allocation, where it is well-defined, to the stock market world, where it is fuzzy and misleading¹⁵.

Is there a “right price” for assets?

In a *Financial Times* article (August 4, 2009), Richard Thaler, a behavioral economist, rightly stresses the confusion between the two different interpretations of the EMH:

Some economists took the fact that prices were unpredictable to infer that prices were in fact “right”. However, as early as 1984 Robert Shiller, the economist, correctly and boldly called this “one of the most remarkable errors in the history of economic thought”. The reason this is an error is that prices can be unpredictable and still wrong; the difference between the random walk fluctuations of correct asset prices and the unpredictable wanderings of a drunk are not discernable

<http://www.ft.com/cms/s/0/efc0e92e-8121-11de-92e7-00144feabdc0.html#axzz1EWYkDIZI>).

But, in the same article, Thaler explains that:

The EMH has two components that I call “The Price is Right” and “No Free Lunch”. The price is right principle says asset prices will, to use Mr. Fama’s words “fully reflect” available information, and thus “provide accurate signals for resource allocation”.

¹³ That is:

the assumption of *rational expectations*: the market clearing price function $p(\cdot)$ implied by consumer behavior is assumed to be the same as the price function $p(\cdot)$ on which consumer decisions are based.

¹⁴ Comparison is made using past (observed) stock prices and dividends, with the representative agent’s marginal rate of substitution – given by the model after its “calibration” – as the discounting factor.

¹⁵ The same happens when models reduced to the (intertemporal) choice of a « representative agent» are labeled “general equilibrium”. But some notorious neoclassical economists (e.g. Solow) disagree with that.

Thaler – contrary to his “golfing buddy” Fama – clearly distinguishes “two components” in the EMH. He unintentionally exposes the ambiguities of the 1970 paper as he quotes its *only sentence* related to the second component (“provide accurate signals for resource allocation”) when the rest of the paper exclusively treats the first interpretation of the EMH (“no free lunch”).

The EMH’s “two components” versions result from Fama’s 1970 and 1973 papers – although the Chicago economist claims that the 1973 paper presents the 1970 model “in a different way”. Thaler has the merit to clarify this point. But, by doing so, he is forced to introduce a new concept: the “right” price, which corresponds to Fama’s “intrinsic value” or “model of equilibrium” price. Thaler admits however that “a theory of how prices are supposed to behave” is then needed, which makes it “difficult” to test the second component of the EMH.

In fact, the test is not “difficult” but impossible. The “right price” – or otherwise the “intrinsic price”, or the “fundamental value” – is an empty concept. Prices depend at least as much on the models (or the theories) in investors’ minds as on outside information. Those models are the result of their education, their past experience, their mood and the way they foresee the future. Samuelson’s “posited probability distribution” is an instance of that sort of model – it represents the common belief about stock prices movements¹⁶. New information affects in different ways investors’ beliefs. Changes are usually smooth but may occasionally be abrupt, as it happens when investors become suddenly pessimistic and shift suddenly from one model of the economy to a very different one.

In summary, new information is “incorporated” in prices, but the way they “reflect” it depends on countless factors, objective and subjective, impossible to disentangle.

Conclusion

An educated economist knows that efficiency means Pareto Optimality. That is, extremely stringent conditions. When markets (prices) are involved, these conditions are: 1. an auctioneer who sets prices for present and (all) future goods, conditional to (all) states of nature. 2. price-taking behavior (that is, belief that it is possible to buy and sell whatever one wants at these prices, without influencing them). 3. agents demands and supplies are added and compared (by the auctioneer) and, when equilibrium prices are established, exchanges are organized (without costs) by the auctioneer – who makes sure that conditional goods are furnished as states of nature became effective.

Indeed, equities and stock markets are not needed for achieving Pareto optimality – that is, efficiency. At (competitive) equilibrium prices, firms’ present and future profits are known, and their owner – households – know the amount of dividends that will accrue to them during the firm’s lifetime¹⁷. The present value of its dividends can be taken as a firm “price” or

¹⁶ Random differences in beliefs originate most of stocks’ transactions. If, for instance, a 10% stock price raise is expected according to the “posited distribution law”, then investors which believe that the raise will be (a little) more than 10% will buy stocks from investors who believe the raise will be (a little) less than 10%.

¹⁷ Prices do not suffice to convey all the information households need to determine their (intertemporal) budget constraint. So, the general equilibrium (Arrow-Debreu) model supposes (implicitly) that they are informed (by the auctioneer?) of firm’s profits.

“value”, but there is no incentive to buy or sell it (or its stocks): an intertemporal household budget constraint does not change if he buys (sells) a stock and gets (does not get anymore) dividends¹⁸.

So, the set of Pareto optima cannot be reached – even approached – in a market (hence decentralized) economy, with or without stock markets. Talking about “market efficiency” should be prohibited, at least for an economist (neoclassical or not) who knows what the words mean. Unhappily, the expression “market efficiency” has surprisingly been accepted with no real opposition by the economic profession, and is still widely accepted. Only ideological pressure – stronger since the seventies – can explain such an anomaly. Even if it be that after the 2008 collapse, few people still claim without reserve that “markets are efficient”¹⁹.

Clear thinking should require a return to the situation prevailing before Fama’s 1970 paper. Nobody felt then the need to refer to “market efficiency” when formulating theories about stock markets. The proper way to proceed is to ask well-defined questions such as: do stock prices follow a random walk? Are arbitrage opportunities left? Can regularities observed in the past be utilized to predict future price variations? How do we explain that some hedge funds or investors – e.g. Buffet, Soros, Druckenmiller, etc. – seem to be able to “beat the market” consistently?²⁰

Unfortunately, discussions focused on the validity of EMH will probably continue, and confusion will persist – with time and energy lost in vain.

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¹⁸ The complete markets assumption is often presented as the possibility to “insure” against diverse “states of nature” occurrences, suggesting that “insurance companies” do the job. In fact, Pareto optimality needs it to be done (costless) by the auctioneer – who collects (conditional) demand and supplies of goods. Household’ choices depend on their tastes (including “risk aversion”) and on states of nature (subjective) probability distribution.

¹⁹ In his 2010 interview to *The New Yorker*, Fama points out real economy “inefficiencies” and exculpates financial markets.

²⁰ Sebastian Mallaby’s book (2010) gives some examples of successful stories that are not easily explained by chance.

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