Was There a "Vernacular Science of Financial Markets" in France during the Nineteenth Century? A Comment on Preda's "Informative Prices, Rational Investors"

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In a recent article in this journal, Alex Preda (2004) analyzes the history of financial economics—also called modern financial theory—from a sociology of knowledge perspective and a sociology of science perspective. Preda's article sheds new light on the emergence of financial economic works in the nineteenth century. It explains how models, graphical tools, and theoretical arguments used by academic science had emerged from rationalization and conceptualization developed outside the science. In the process, Preda's article introduced an intermediate step: "vernacular economics," which "is understood to comprise heterogeneous sets of practices, know-how techniques, and rationalization procedures that help social actors make sense of their economic environment and of the economic consequences of their own actions. Rather than a body of homogeneous, abstract, and formalized explanations of economic processes, vernacular economics is grounded in tacit, commonly shared assumptions and knowledge about economic processes" (Preda 2004, 354). In addition, it is "shabbier and not rigorous" and is "oriented toward solving everyday problems, [while] the academic variety is more concerned with elaborating a unified conceptual frame" (354). There is another important criterion to separate these two kinds of economics: the social group that publishes

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the work or to whom these publications are addressed. We have "the academic [versus] the nonacademic science of financial markets" (356), that is, academic science versus vernacular science. As Preda's article explains, recent research has been examining the relationship between academic economics and vernacular economics. While it is generally considered that these two kinds of science coexisted, Preda suggests that the latter existed before the former. More precisely, the aim of the article is to show how "popular" efforts transformed financial investing into an academic science (356). The article succeeds in showing how a rationalization and a conceptualization of financial attitudes had led to the development of abstract concepts, abstract tools, and rational investment rules, which were used later by academic researchers to build a new academic science.

The analysis of this progressive evolution is made through the "cognitive and cultural background" of authors who published during the same period, such as Jules Regnault and Henri Lefèvre—that is, authors who published between the 1860s and the end of the 1890s. The cultural background must be understood as the financial practices and knowledge of that time. This focus on financial practices and knowledge aims to defend the hypothesis that academic financial economics comes from practical problems, which were analyzed first by vernacular financial economics. To support this hypothesis, Preda identifies an international "vernacular science of financial markets." Within this science, vernacular financiers would have used the same tools, concepts, hypotheses, and methods that would have been "popular" during the nineteenth century in France, the United States, and the United Kingdom. In other words, the article points out that there was no geographical limit for such practices and knowledge at the time—at least not in Western countries. Moreover, because this international movement was not structured as an academic science and did not share the above criteria used to separate academic science from vernacular science, Preda considers it to be vernacular financial economics, which had promoted hypotheses used around thirty-five years later by academics such as Louis Bachelier. Obviously, Preda's article concludes that "we cannot argue anymore that we have a string of isolated 'moments of genius'—Jules Regnault in the early 1860s, then Henri Lefèvre in the early 1870s, and then Louis Bachelier. . . . it was not cultural exceptionalism but the French investor's search for practical answers to practical problems, arising in the everyday preoccupation with financial investments, that accounts for those developments"

(380). However, there are two major difficulties with Preda's argumentation. First, the relevance of the distinction between vernacular economics and academic economics for economic or financial theoretical work in nineteenth-century France remains unclear, and so does the justification of classifying Regnault and Lefèvre's work as vernacular science. Second, the construction of the general movement that dealt with the "vernacular science of financial markets" rests on several points of confusion about algebra and probability as well as about options and futures or bonds.

1. The Difficult Distinction between "Vernacular" Economics and "Academic" Economics

1.1. "Vernacular" Economics and "Academic" Economics in Nineteenth-Century France

Toward the end of the nineteenth century, several communities of economists and several kinds of economic works existed in France. With the distinction between "academic" science and "vernacular" science, how do we classify the French econo-engineers or the French actuaries who developed microeconomics and mathematical economics (Zylberberg 1990; Ekelund and Hébert 1999)? To be sure, just like most French economists, the large majority of econo-engineers and actuaries were not academic economists, and their interest was in solving practical problems—such was the case with Jules Dupuit (Ekelund and Hébert 1999). As Robert Ekelund and Robert Hébert (1999, 39) explain, "Why were French engineers more productive in the development of economic theory than the orthodox economists? Perhaps part of the answer lies in Albert Caquot's boast that 'engineers *do* economics while others talk about it.'"[1] Nevertheless, there was a significant point of contrast between the econo-engineers and French economists as a whole. The former used rigorous demonstration and formalized and abstract explanations. By contrast, at the end of the nineteenth century, the majority of French economists in academia were opposed to the use of mathematics or abstract reasoning. Their works were descriptive, provided few demonstrations—literary or mathematical—and were less rigorous than those developed at the same time by econo-engineers.

1. Caquot's boast is cited in Divisia 1951, x.

The institutionalization of economics in France also helps show that the distinction between vernacular economics and academic economics does not apply easily to nineteenth-century France. In France, economics was only institutionalized in 1877 (Le Van-Lemesle 1991, 2004). Before, the educational system was a casual affair: as Le Van-Lemesle (2004, 9) explains, during the nineteenth century in France, liberal practitioners created and elaborated an informal system to spread economics.[2] Thus, until the 1870s there were French economists who used and developed bodies of homogeneous theories, but there were no academic economics.[3] These economists were practitioners who learned economics on their own from books, by attending private conferences and participating in *sociétés savantes*—like the Société d'économie politique—and by taking a few courses here and there (Le Van-Lemesle 2004, 163–64). In view of this, it is fair to say that during the nineteenth century and until 1877, the distinction between practitioners and theoreticians was not appropriate for the simple reason that all theoreticians were also practitioners (Le Van-Lemesle 2004, 190).

1.2. Can the Works of Regnault or Lefèvre Be Considered as Vernacular Science?

Is it appropriate to regard the contributions of Jules Regnault and Henri Lefèvre as vernacular science? To include their works in a vernacular science of investment, as Preda does, one must demonstrate that they meet the criteria outlined in the introduction. As we will see, this inclusion is dubious.

The first criterion, as the reader may recall, pertained to the kind of work. To include their work in "vernacular economics," "to which Regnault and Lefèvre contributed" (Preda 2004, 355), means that their works are "shabbier and not rigorous." If we compare Regnault's work with a current book on mathematical finance, obviously it can be easily considered not rigorous, but in comparison with books published in economics or in finance at the time, in particular in France, it *was* rigorous. For instance, Bernard Bru explained that "there is a gigantic body of lit-

2. Economics education was promoted by liberal economists and was mainly based on Jean-Baptiste Say's theoretical works.

3. Some economics courses were being offered at French grandes écoles and universities, but the courses were not part of a larger curriculum and were not offered on an ongoing basis. For instance, the first course was given at the École normale in 1795, but after four months, it was discontinued (Le Van-Lemesle 2004, 47–54).

erature on the Exchange [in the nineteenth century in France]. But these are not interesting books ("How to Make a Fortune," etc.). There's Regnault's book which is unique, and which we know about" (Taqqu 2001, 14). Unlike other publications, which aimed at educating investors, Regnault's book contains theoretical models and empirical tests,[4] and it took its place nicely in the academic and scientific debates of the time about the social sciences—it used in particular conventional scientific criteria (i.e., criteria of academic science). More precisely, this book extended Adolphe Quételet's research program to a new field: the determination of "scientific laws" that rule financial markets (Jovanovic 2001, 2006a).[5] We know that Quételet was the first to realize the Condorcet and Laplace program, which aimed at applying the theory of probability to the social world. From Quételet, Regnault borrowed the tools, the hypotheses, and the methods, as well as the style for presenting his results (Jovanovic 2006a).[6] Contrary to Regnault, financial manuals published during the same period did not use mathematical demonstration or empirical validation, and their statements were not discussed in academic debates or academic programs. For these reasons, Regnault's book differs from other financial publications of the mid-1860s: it is difficult to consider it as "shabbier and not rigorous" and to consider that it does not use abstract or homogeneous explanations. These remarks also apply to Henri Lefèvre's work (Jovanovic 2002, 2006b).

The second criterion dealt with the social group that publishes the work or to whom the publications are addressed. To include Regnault and Lefèvre's works in "vernacular" economics also means that they were not addressed to or published by academics. Indeed, Preda (2004, 353) explains that "neither Jules Regnault nor Henri Lefèvre did actually write for an academic readership. . . . Their publications explicitly addressed investors, and their aim was to provide practical advice." Preda adds that "by calling Regnault and Lefèvre 'economists,' against their own judgment, we risk privileging 'intellectual accidents,' according to which financial economics was developed by isolated individuals who had few

4. This use of data constitutes one of the first pieces of econometrics and has no equivalent in other financial publications of the time. See Jovanovic and Le Gall 2002 and Le Gall 2006.

5. Jules Regnault and his brother studied in Brussels when Quételet had a great influence and audience in the country, which led him to reform both education and research (Jovanovic 2006a).

6. Transfers of tools, methods, and hypotheses used in a discipline already recognized as a science are common in attempts to create a new science.

things in common (if any) with the vernacular financial knowledge of their time" (355). We have explained above the particular place of economists in France before 1877: when Regnault published his book, there was no academic community or courses in finance. Despite that, Regnault does not refer to publications addressed to investors but only to academic publications in the social sciences.[7] Moreover, although his book was taken up in public debates (Jovanovic and Le Gall 2001), several elements show that it was not addressed to investors at first, but to scientists and scholars.[8] Henri Lefèvre, who started to publish in finance after Regnault, was a teacher and a French actuary.[9] He created at the Institut polytechnique—not to be confused with the École polytechnique—a course in "higher financial education" and published a number of textbooks or pedagogical books that dealt with theoretical and academic considerations. As he explained, "It is in speculative trade that political economy will discover the theory of the circulation of wealth, which is one of the principal objects of its investigations" (1879, 19). Moreover, in 1882, he published a brochure, of which Mr. Harang, president of the education section of the Seine Accountancy Committee, writing in the 1 August 1882 issue of the *Revue de la comptabilité*, proclaimed that "the teaching of accounting will soon be divided into two schools: one consisting of the partisans of practical education and the other, the partisans of theoretical education. *Without any doubt, the theoretical school will have been founded by Mr. H. Lefèvre*" (emphasis in original). This initial brochure was supplemented by a later work published in 1885, *La comptabilité: Théorie, pratique, et enseignement*. In that book, Lefèvre explains that "the existing books on stock markets and banks are of no help toward the understanding of the very mechanism of their operations, although such was their aim. . . . The *Traité des opérations de Bourse*, by Courtois, sheds no light on their operations; . . . no precise idea that could

7. Regnault quotes from only one book from a financier; all other quotations come from mathematicians, philosophers, and economists.

8. At least two elements are worth noting in that direction. One, Regnault's book has two publishers. One of them, Mallet-Bachelier, was the most important publisher for scientific books at that time in France. Mallet-Bachelier did not publish books in finance (while the second publisher, Castel, did), and generally published books for specialists, rarely for a large public. Two, the title of Regnault's book refers to a scientific question and not to a practical problem: *calcul des chances* is an expression used by mathematicians interested in probability calculus.

9. He took a degree in natural sciences in 1848, but from the 1850s onward steered his career toward economics, working his way into in the selective circle of economic journalists. His first publications were addressed to investors, but beginning in the 1860s his publications were mainly academic (Jovanovic 2006b).

help toward teaching or a scientific approach can be found here" (Lefèvre 1885, iii).

Regnault and Lefèvre are the two major examples used in Preda's article. But they are not unique: Preda also interprets Brasilier in the same perspective. However, is it legitimate to include Brasilier's work in a vernacular science of financial investment? Brasilier was a graduate of the École polytechnique and a teacher in the two most prestigious *grandes écoles* in France at the time: l'École des hautes études commerciales (HEC) and l'École supérieure de commerce de Paris (ESCP). His book, a textbook for students in applied mathematics, is rigorous and not shabby. Moreover, Brasilier (1891–93) presented and considered his work as one of actuarial science, a science that still existed at that time.[10]

2. Was There an International "Vernacular Science of Financial Markets"?

To demonstrate the existence of an international "vernacular science of financial markets," Preda suggests that a number of authors applied to finance the same tools, data, and hypotheses as those used by Regnault and Lefèvre. Thus, according to Preda, during the nineteenth century, many authors would have used the probability calculus to analyze stock prices, would have compiled stock price data, would have used seasonal stock price variations in their analysis, and would have analyzed options and would have tried to price them, etc. However, these authors do not form a homogenous group, and Preda does not provide any systemic demonstration that all authors were concerned by the same problems. For instance, the argument is made that, when Regnault published his book, price recording was not "standardized" (Preda 2004, 366, 370). This standardization would come from the influence of new technology: the introduction of the ticker in 1867 in New York and in 1872 in London (367). The influence of this new technology on price recording would explain some differences between the two French authors, Regnault and Lefèvre, on the way "prices were perceived" (368): "There is a striking difference between Jules Regnault (who wrote in 1863) and Henri Lefèvre, who was writing in the 1870s" (368). However, it is never mentioned if the ticker had ever been introduced in Paris, and, obviously, to affirm that an innovation

10. In the 1870s, French actuaries started to analyze stock markets with their own tools. The first three actuaries who published on this topic were Hippolyte Charlon, Henri Lefèvre, and Edmond Maas.

existed in the London Stock Exchange or in the New York Stock Exchange does not demonstrate that this innovation was used in the Paris Stock Exchange and that financial practices in the Paris Stock Exchange had to be adapted. More generally, Preda's case that an international community of vernacular financiers existed is not convincing because it originates in several errors and confusion. Two kinds of confusion can be pointed out: (1) confusion about whether the authors were discussing futures or options; (2) confusion between algebra and probability in interpreting how securities were being priced at that time in France.

2.1. Different Problems and Different Goals

The first part of section 7 of Preda's article explains how "trading in options was conceptualized in a way that made it apt for a formal, abstract treatment." The argumentation of this part is confused in several respects about securities. It is explained that the distinction between speculating (*spéculer*) and gambling (*jouer*) used by Regnault was a kind of "strategy" for the authors of that time to analyze options: "Most French manuals (and some non-French ones too) . . . followed the strategy of differentiating between speculating (*spéculer*) and gambling (*jouer*). Jules Regnault (1863, 36), among others, operated with this distinction. While speculation designated the usual operations in stocks and bonds, gambling designated the operations in calls and puts and their various combinations" (Preda 2004, 376). There appears here to be a twofold confusion about, on the one hand, whether the writers were discussing options or other securities, and, on the other hand, the origin of the distinction between speculation and gambling in France. Concerning the first confusion, in this section 7, Preda explains that Regnault's analysis deals with options trading, but Regnault's book does not deal with options. It analyzes a French bond, the *rente* 3%. In the same section, Proudhon is quoted about options trading to explain that "many authors of investment manuals argued that options provide the public with a fair market" (Preda 2004, 375). However, there is a mistake in the translation, because Proudhon deals with futures and not options. Moreover, the justification of the fair market—"a put or a call contract benefits both parties and nobody loses, since the money is anyway attracted from other sectors of the economy" (Preda 2004, 375–6)—does not particularly fit well for the nineteenth century. It was not until 1973, with the appearance of the Black, Scholes, and Merton model, that the fact that

nobody loses could be accepted;[11] before that time, the method of pric-
ing options did not allow for that assumption.[12] Another point of confu-
sion concerns the origin of the distinction between speculating and gam-
bling in France. Contrary to what the article suggests (Preda 2004, 376),
this distinction was not a "strategy" used by French financiers who pub-
lished manuals. It was a juridical distinction made by French law at least
since the end of the eighteenth century—in particular the law about the
gambling exception (*exception de jeu*).[13] It is misleading to explain that
while speculation designated the usual operations in stocks and bonds,
gambling designated the operations in options (Preda 2004, 376). Indeed,
the French law defined the *jeu* (gambling), also called *agiotage*, as bet-
ting based on price differences. Gambling concerned all securities—
shares, bonds, options, and futures—and not merely options, as Preda's
article suggested.[14] It is also the reason why Regnault used this distinc-
tion although his book does not deal with options. It is equally mis-
leading to consider the *coulisse* as the unofficial French options market
(Preda 2004, 367) because it not merely specialized in options but also
traded shares and bonds.[15] For these reasons, authors who analyzed the

11. We can accept that the Black-Scholes-Merton model eliminates the risk if all its
hypotheses are verified and if the stochastic process that represents the variations of the
underlying asset is well specified. Of course, in reality, risk is never eliminated because the
hypotheses are never fully verified.

12. See, for instance, Bouleau 1998.

13. This distinction does not date from that time. Today, we would speak in terms of
speculators and investors.

14. We find the same distinction in Williams 1938.

15. Options trading was legalized in France on 28 March 1885. However, between 1860 and
that date, options trading, although illegal, was informally recognized, and options were traded
on all financial markets. Let me remind readers of the following two points. (1) On 22 June
1859, the Compagnie des agents de change (Syndic of the Stockbrokers) registered the first
complaint against the *coulissiers*. The *coulissiers* were condemned by the "*arrêt de la cour de
Cassation du 19 janvier* 1860." However, they were not condemned because they had traded
options (although options were not allowed); they were condemned because they had traded
outside the official market. This "*arrêt*" (given by the court of cassation, the highest court in
France) expressed the exclusive right of the *agents de change* to trade options, although these
operations were condemned by the law! In other words, the judge was conscious of the obso-
lete nature of the law, and because, according to French law, he could not come into conflict
with the legislator, he used this *arrêt*, and the jurisprudence that it created, to obtain a result
that appeared to him "right." Therefore, this *arrêt* led the law to informally recognize options
beginning in 1860. (2) Moreover, in 1861, the prices of French bonds tended to fall. One reason
for that fall was the lack of liquidity, which was usually provided by the *coulisse*. The minister
for finance convened *agents de change* to testify to his dissatisfaction with them, because they
had a monopoly on transactions. Fearing the final suppression of their monopoly, the *agents de
change* promised not to prosecute the *coulisse* again. At the same time, the government tolerated

French stock market commonly used this juridical distinction between speculating and gambling. Consequently, because this distinction is an institutional datum (juridical) and not a deliberate strategy, it is not possible to deduce from this use that the analysis of Regnault was common.

Preda (2004, 360) argues that the vernacular science of investment introduced conceptual changes that "were not just a new literary form": "around the same time that Henri Lefèvre and Jules Regnault were writing," "general rules of action were formulated" (362). The demonstration is supported by an example of "rules concerning options trading," which is reported from a French manual. It is described as "algorithms for projecting profits and losses." In this example, the word *algorithm* is used as per a finite ordered set of well-defined rules for the solution of a problem. However, this kind of example is not an algorithm. According to the nineteenth-century terminology of options trading and following the example quoted, if "we sell 6,000 francs of French 3 percent bonds at 71.50 at 1 franc premium and we buy the same quantity at 71.90 at 50 centimes premium [we] limit gains to 1,000 francs and losses to 800 francs" (362), there are two possible results.

1. If the price increases, the options will be exercised, and we lose the difference between the two exercise prices $(71.90 - 71.50) \times (6000/3) = 80$ francs.
2. If the price decreases, the options will not be exercised, and we earn the difference between the two primes $((6000/3) \times 1) - ((6000/3) \times 0.5) = 100$ francs.[16]

There is no algorithm here, only an algebraic calculus. It is also difficult to consider it as a specific rule of action or as a rule specific to options trading, because it was common, during the nineteenth century, to give algebraic examples to express the financial terminology, which was not always easy to understand. For instance, the price of buying 60 francs of French 3 percent bonds at 71.50 was equal to $(71.50) \times (60/3)) = 143$ francs. Obviously, such an example does not deal with options and it is not a rule of action per se.

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the "illicit" meetings of the *coulisse* and did not prosecute them any more (Tétreau 1994, 101–6). In other words, the *coulisse* was informally recognized.

16. That strategy is nowadays called a "bullish call spread."

2.2. The Unusual Use of Calculus of
Probability to Analyze Stock Price Variations

Preda argues that it was not uncommon for financial guides to use the calculus of probability to analyze stock markets and stock price variations: "some manuals applied probability calculus to the evaluation of financial securities" (Preda 2004, 374) and others "tried to explain the causes of fluctuations in securities prices in probabilistic terms" (376). However, the argument rests on a confusion between algebra and probability.

For instance, it is explained that some authors used probability calculus to price options:

> Starting from past fluctuations in prices, manuals also tried to compute the probability of securities prices' attaining a certain level in a given time interval and to take this as a basis for the price of the corresponding option. One favorite method . . . was to take the interest on a state bond as a reference point. . . . ; afterward, differences between the yield of a given security and the bond's yield were computed over a period of time. On the basis of variations in these differences, the magnitude of future fluctuations was inferred; this served as a method for establishing options prices (Medbery 1870, 207–8). (Preda 2004, 377)

If the above were accurate—if James K. Medbery used probability calclus to price options—Preda should have specified that Medbery and not Louis Bachelier was the first to do this, contrary to current belief. This discovery would be a crucial contribution in the history of financial economics, and it would certainly merit an article. However, in the extract quoted by Preda, Medbery deals only with shares, not with options. Moreover, there is no probability calculus in Medbery but only a rule of three. In fact, Medbery prices a security, which has a par value equal to 100 and a face return of 7 percent: consider a "stock costing one hundred dollars, and paying seven dollars yearly in dividends. . . . Now, if the same stock should permanently pay eight per cent, its true value in the market would be the equivalent of that sum, which at-seven per cent would give eight dollars in interest" (Medbery 1870, 207). If the firm guarantees a return of 8 percent—Medbery speaks of "guarantee interest"—then the price—which he calls "the true value"—X, is equal to $X \times 0.07 = 8$, then $X = 114.28$. Medbery gives a table for the price of this security if the guarantee interest is 9 percent, 10 percent, etc.

In the same way, the suggestion that the probability calculus was largely used to price securities comes from a questionable interpretation. On pages 376–78, three authors—de Mériclet, Medbery, and Pinto—are used to argue this common use. Although the article acknowledges that de Mériclet and Pinto were strongly opposed to its use, it is deduced that "the search for a probabilistic explanation of price variations was well on its way" (Preda 2004, 377) and that "this is a biting critique of the attempt to develop a causal explanation of price movements based on probabilistic calculus and the evaluation of (insider) knowledge. It shows, however, that two lines of inquiry were entangled here: (1) the application of probability calculus to market decisions and (2) the impossibility of causal explanation of price variations" (378). It is added: "The belief that probabilistic calculus was an adequate method for analyzing price variations was firmly embedded in the popular science of the market" (378). No real example is given to support these affirmations except Medbery, whom, as I explained, is misinterpreted, because Medbery did not use probability calculus. More generally, the article suggests that if authors wrote about the possible application of probability calculus to price securities, the probability calculus to price securities was effectively used in practice. However, it is well known that, during the nineteenth century, the application of probability calculus was strongly debated and little applied; and just because several authors used the words *probability* or *probabilistic calculus*, they did not necessarily make an analysis based on the calculus of probability.[17] Consequently, Preda's article gives no proof that the probability calculus was used to analyze price fluctuations or to price securities during the nineteenth century. Until now, Regnault is the only author known to have used the probability calculus to analyze price securities.[18]

The conclusion of section 7 in Preda's article provides another example of confusion between algebra and probability. It is explained that "we encounter a manifold preoccupation with applying probability theory to financial investments," including applying it "to the analysis of French bonds resembling lottery tickets" (Preda 2004, 379). A French author is quoted, "Brasilier, who believed that 'all questions of long term

17. During the nineteenth century, the possibility of using probabilistic calculus in moral and social sciences was criticized because it was thought as inconsistent with human free will. Thus, many authors fought against using it (Breton 1991): although they used the words *probability* or *probabilistic calculus*, they did not use this kind of calculus. It is exactly what we have in the quotations of Pinto and de Mériclet.

18. See Taqqu 2001, 14, or Jovanovic and Le Gall 2001.

investments are very often only algebraic questions', [and who] set out to elaborate a probabilistic model of the bonds' lifespan and of the real interest rate. These corporate bonds were to be treated as a lottery problem" (379). In the first part of the present article, we explained the difficulties of including this author in the vernacular science of investments. There is another problem here. It is well known that some bonds have optional clauses—for instance, refunding clauses. During the nineteenth century, and not only during this century, some bonds offered in addition to interest, the possibility of earning money, thanks to a lottery. Each bond had an identification number, and a lottery was organized with these numbers. These lotteries were a way to attract investors to the bond. Consequently, some bonds could be linked with a lottery, but the bonds themselves were neither analyzed nor treated as a lottery problem, nor as resembling lottery tickets. Brasilier calculates the mathematical expectation of the lottery and adds it with the interest to have the mathematical expectation of a bond.

The confusion between algebra and probability also leads to the misunderstanding about the contribution of the authors. For instance, Henri Lefèvre's expression, "*les lois des différences*," is translated as "laws of *differences*" (Preda 2004, 372), and afterward it is argued that "laws of differences" must be understood by *lois des écarts* (373), an expression close to that of Regnault. This association suggests that Lefèvre used "*loi des écarts*," as Regnault did. The law of deviation—or law of difference, as Preda has chosen to translate the phrase—is a consequence of Regnault's probabilistic model, the random walk: "the deviation of prices is in direct proportion with the square root of time" (Regnault 1863, 50). Nevertheless, Lefèvre never used a random walk model in his analysis. He did not use probability calculus; he only calculated differences between two prices. Thus, in Lefèvre, the difference is only a subtraction, which is totally different from the consequence of a random walk model. Moreover, the title of Preda's article can lead to confusion, because, except Jules Regnault and Louis Bachelier, all other authors studied did not deal with the random walk hypothesis.

3. Concluding Remarks

In the end, Preda's article fails to demonstrate the existence of an international "vernacular science of financial markets" that shared the same tools, hypotheses, and methods. No evidence is given that other authors

besides Regnault used the probability calculus to analyze stock price variations before 1900. There is no demonstration that Regnault's book was similar to other publications of that time. Moreover, if some authors discussed the possible application of probability calculus, no evidence is given that they built a theoretical model or a theoretical analysis in finance. The situation seems more complex than Preda's article suggests. Although there was a movement that started to deal with stock markets, as the article clearly exposes, it was not homogeneous. Currently, we only know of two authors, Regnault and Lefèvre, who imported, at that time, tools, methods, and concepts from scientific disciplines to analyze stock markets and to attempt to create a new science (i.e., a new academic science, to use Preda's term). However, these attempts did not lead to the creation of a new academic science at that time; such a science was only constituted during the twentieth century. From this viewpoint, the work of these authors cannot be included in the vernacular economics described in Preda's article. As Philippe Le Gall and I have shown, Regnault—as well as Lefèvre—was not an isolated author (because his work was the product of its time),[19] but he was the first to introduce methods and hypotheses nowadays used to analyze stock markets. Preda's article helps us better understand the progressive movement that took place during the nineteenth century, but this movement needs to be analyzed more carefully.

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19. As we showed, Regnault's work was included in scientific, juridical, and methodological debates specific to the nineteenth century; Regnault used the tools, methods, and hypotheses available in his time; his work was published in a period of evolution for French financial markets and French laws. See Jovanovic and Le Gall 2001, 2002, and Jovanovic 2001.

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