

# **On the Analogy Between Scientific Study of Technical Analysis and Ethnopharmacology**

## **Abstract**

The paper describes an analogy between two fields of study inspired by ‘folk science’ in distant scientific disciplines: financial economics and pharmacology. As the methodology of ethnopharmacology is much more developed than the methodology of scientific investigation of technical analysis, the former could serve as a kind of reference point for the latter. Conducting study of technical analysis according to strict scientific standards should contribute to the development of financial economics, especially important from the perspective of the current debate between neoclassical and behavioral paradigm. Thus, the paper tries to apply analogical reasoning with the aims of proposing a systematic research program and formulate hints regarding it.

## ***Introduction***

In the paper, we present an analogy between ethnopharmacology and scientific study of technical analysis. The key similarity between these two paths of research is the fact they are both based on folk science. One of the differences is the level of development of both fields. While ethnopharmacology has a relatively long and successful history of its contribution to pharmacology, scientific papers on technical analysis have rarely been published in the financial economics journals. One of the results of this state of affairs is a lack of a generally accepted methodology used in technical analysis studies.

The analogical reasoning leads to a probable assumption that a systematic research program directed at analyzing technical analysis practice should be beneficial for the development of financial economics. Obviously, analogical conclusions are not of the validity of deductive ones. Nevertheless, in the proposals of new paths of research we cannot expect irrefutable statements concerning their future results.

We believe that scientific study of technical analysis could be even more beneficial for the development of financial economic than ethnopharmacology contributing to expanding pharmacological knowledge. The supposition is based on the fact that financial economics is now in the stage of paradigmatic debate and so new research results can have important influence on the whole discipline. The debate is challenging the current neoclassical paradigm. Behavioral and other (e.g. evolutionary) approaches are regarded as its alternatives. The technical analysis research seems to have a potential to support these new approaches.

The paper is organized in five sections. The first section is a brief overview of ethnopharmacology. Section 2 is dedicated to the description of technical analysis – its practice and scientific studies. Sections 3 and 4 enumerate some similarities and differences between ethnopharmacology and scientific studies of technical analysis. In Section 4, we try to identify

hints for technical analysis scientific research on the basis of ethnopharmacological experience. The paper ends with conclusions.

### ***1. Brief overview of ethnopharmacology***

Ethnopharmacology is a branch of pharmacology dedicated to the study of the effectiveness of traditional drugs. ‘Many valuable drugs of today (e.g., atropine, ephedrine, tubocurarine, digoxin, reserpine) came into use through the study of indigenous remedies. Chemists continue to use plant-derived drugs (e.g., morphine, taxol, physostigmine, quinidine, emetine) as prototypes in their attempts to develop more effective and less toxic medicinals’<sup>1</sup>. The community of ethnopharmacologists has its own associations (the International Society for Ethnopharmacology, the European Society of Ethnopharmacology) and peer-reviewed journals (Journal of Ethnopharmacology, Ethnopharmacologia). Moreover, many other disciplines closely connected with ethnopharmacology deal with the study of indigenous drugs. Examples include: phytotherapy research (known also as medical herbalism or herbal pharmacotherapy), phytochemistry, complementary and alternative medicine (CAM). All of them have their academic associations and publications. In the USA, there is even a government agency (The National Center for Complementary and Alternative Medicine) devoted to funding scientific research on complementary and alternative medicine. Thus, claims made by folk medicine have been intensively verified with modern scientific methods.

## ***2. Brief overview of technical analysis***

### ***2.1. Technical analysis in practice***

Technical analysis is a general term for a number of methods aimed at forecasting securities price movements. According to the definition by the Market Technicians Association, technical analysis is ‘the study of data generated by the action of markets and by the behavior and psychology of market participants and observers’<sup>2</sup>. There are four main inputs of data analyzed by market technicians: past prices (used the most often), volume, open interests and results of surveys measuring the so-called investor sentiment. Among the most popular technical analysis methods are, for example: support and resistance levels, chart patterns, moving averages, oscillators, contrarian investment, point and figure charting, candlestick charting, cycles, Elliott wave theory, Gann theory. All these methods were created by practitioners on the basis of their experience and without conducting scientific studies experimentally verifying the results. Some of these concepts have subjective nature (e.g. pattern recognition in charting), some apply well-grounded scientific methods without proving their usefulness in the context of financial markets (e.g. cycle studies sometimes refer to spectral analysis), and some have even esoteric connotations (e.g. Gann theory was created by W.D. Gann, not only a trader but also an astrologer and a numerologist).

Technical analysis is often applied to create trading systems – i.e. sets of methods generating ‘buy’ and ‘sell’ signals. There are also systems integrating technical with fundamental analysis<sup>3</sup>.

The history of technical analysis dates back to the 18<sup>th</sup> century when a Japanese businessman

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<sup>1</sup> The editorial statement of the Journal of Ethnopharmacology.

<sup>2</sup> B. Kamich, The art and craft of reading the market Analysing the market, rather than the companies whose shares are traded, is a well-established technique. Bruce Kamich believes technical analysis has a golden future, Financial Times, 9 July 2001

<sup>3</sup> Fundamental analysis is a term for a different (than technical analysis) set of methods aimed at forecasting securities’ price movements. Their distinctive feature is their concentration on determining a fundamental (intrinsic)

Munehisa Homma applied his candlestick charting techniques in order to forecast the price movements at the Dojima Rice Exchange in Osaka. In the west, technical analysis was pioneered by Charles Dow at the end of the 19<sup>th</sup> century.

## ***2.2. Scientific study of technical analysis***

Most of today's scholars in the field of financial economics are representatives of the approach, which could be called neoclassical finance. In this neoclassical paradigm, the main idea concerning predictability of securities prices is expressed by the efficient market hypothesis<sup>4</sup>. The key practical implication of the hypothesis is the impossibility of creating investment strategies repeatedly giving abnormal (called also 'excess') profits<sup>5</sup>. Therefore, in neoclassical finance, technical, as well as fundamental, analyses are regarded as useless for predicting securities price movements<sup>6</sup>. Any evidence indicating possibility of existence of the above strategies are called anomalies. Nevertheless, rational finance either seeks a rationale for their existence by extending the hypothesis while still staying in its framework or interpret them as only minor exceptions not refuting the hypothesis (a typical example of idealization in science).

Until recently, an assumption of a value of technical analysis was almost completely rejected by the academic community. As Lo, Mamaysky and Wang put it: 'one of the greatest gulfs between

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value of a security. The typical data inputs for fundamental analysis are, inter alia: financial statements, earning forecasts, market analyses, macroeconomic data.

<sup>4</sup> The Efficient Market Hypothesis has three forms proposed for the first time in H. V. Roberts, *Statistical Versus Clinical Prediction of the Stock Market*, CRSP, University of Chicago, May 1967: weak, semi-strong and strong. The weak form states that all past market prices and data are fully reflected in securities prices. The semi-strong form states all publicly available information is fully reflected in securities prices. And strong form states that all information is fully reflected in securities prices. The consensus among financial economists exists that the strong form is not met in practice. Nevertheless, it is still a disagreement to what extent real financial markets are close to the two remaining forms of the Efficient Market Hypothesis.

<sup>5</sup> Abnormal (excess) return is a return exceeding a risk-adjusted return. Risk-adjusted return is a required rate of return that is required by risk-averse investors to compensate them for the risk of investing in the security. The risk-adjusted return is calculated from asset pricing models and there are many such alternative models. Therefore, in practice, it is impossible to unambiguously determine both risk-adjusted return and abnormal (excess) return.

academic finance and industry practice is the separation that exists between technical analysts and their academic critics. In contrast to fundamental analysis, which was quick to be adopted by the scholars of modern quantitative finance, technical analysis has been an orphan from the very start. It has been argued that the difference between fundamental analysis and technical analysis is not unlike the difference between astronomy and astrology. Among some circles, technical analysis is known as “voodoo finance”<sup>6</sup>.

The reason of the acceptance of fundamental analysis – regarded, together with technical analysis, as useless for forecasting securities price movements - among academic community is the fact that it is also applied beyond financial markets, for example for valuation of private companies. Moreover, while technical analysis usefulness controverts the weak form of EMH, fundamental analysis usefulness controverts the semi-strong form of EMH. Thus, more restricted conditions, than in the case of fundamental analysis, have to be met for technical analysis to be effective.

Nevertheless, in financial economics literature, there have been some papers statistically proving effectiveness of certain technical analysis strategies<sup>8</sup>. As mentioned above, these studies were regarded as anomalies of market efficiency. However the most convincing examples of market inefficiencies are not based on complex statistical inference. These are cases of the occurrence of the so-called speculative bubbles, with dot.com one being the most recent and striking example. Neoclassical finance does not have a satisfactory explanation of these situations. On the contrary, behavioral finance explanations based on the so-called mass psychology (or herding) seem to

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<sup>6</sup> Obviously, the conclusion refers to the situation where semi-strong form of the Efficient Market Hypothesis is met but necessarily the strong one.

<sup>7</sup> A.W. Lo, H. Mamaysky, J. Wang, Foundations of Technical Analysis: Computational Algorithms, Statistical Inference, and Empirical Implementation, *Journal of Finance*, Vol. 55, Issue 4, August 2000, pp. 1705-1770

<sup>8</sup> E.g. W. Brock, J. Lakonishok, B. LeBaron, Simple technical trading rules and the stochastic properties of stock returns, *Journal of Finance*, Vol. 47, Issue 5, 1992, pp. 1731-1764; C. Osler, K. Chang, Head and shoulders: Not just a flaky pattern, Staff Report No. 4, Federal Reserve Bank of New York, 1995

gain a lot of acceptance even among conservative financial economists<sup>9</sup>.

The growing number of studies documenting anomalies gave rise to the field of behavioral finance. It is also worth noticing that already before technical analysts tried to justify their methods with psychological arguments. Obviously, current academic behavioral finance do not confirm most of the claims of market technicians but certainly with the rise of behavioral finance technical analysis gained some support from academia.

As the field of behavioral finance was attracting more and more scientists, it was also getting respect in the mainstream of financial economics. The important sign of this phenomenon was granting The Nobel Prize in 2002 to Daniel Kahnemann and Vernon Smith<sup>10</sup>. Moreover, recently the most prestigious financial economics journals have been publishing papers not only statistically demonstrating a practical value of technical analysis but also explaining the behavioral mechanisms underlying usefulness of the approach (e.g. psychological perception of the round numbers<sup>11</sup>).

At the time, neoclassical-behavioral debate seems to be at the center of financial economics. We present the view (similar to the one by Brav, Heaton and Rosenberg<sup>12</sup> as well as Kai<sup>13</sup>) that a potential new paradigm of financial economics would be neither neoclassical nor behavioral but the combination of them both perhaps with the influence of different approaches. One of such promising approaches (called agent-based computational finance) makes use of computer

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<sup>9</sup> See B. G. Malkiel, *A Random Walk Down Wall Street: Completely Revised and Updated Eighth Edition*, W.W.Norton & Company, 2004

<sup>10</sup> Daniel Kahnemann is a psychologist who studied the so-called heuristics and biases of human judgment, which are key explanation factors of investors' not rational decisions in behavioral finance. Vernon Smith is named a father of experimental economics – a field of research that has given a lot of experimental evidence of not fully rational decisions in a trading environment – and now one of the editors of the *Journal of Behavioral Finance*.

<sup>11</sup> C.L. Osler, *Currency Orders and Exchange Rate Dynamics: An Explanation for the Predictive Success of Technical Analysis*, *Journal of Finance*, Vol. 58, Issue 5, October 2003, pp. 1791-1820

<sup>12</sup> See A. Brav, J.B. Heaton, A. Rosenberg, *The rational-behavioral debate in financial economics*, *Journal of Economic Methodology*, 2004, vol. 11, Issue 4, pages 393-409

<sup>13</sup> See D. Kai, *Efficient Markets Hypothesis and Behavioral Finance: A Kuhnian Review*, May 2004, [www.ssrn.com](http://www.ssrn.com)

simulations of financial markets with artificial traders. Most studies in this approach assume that some traders base their decisions on technical analysis. One of the biggest achievement of agent-based computational finance seems to be proving that an occurrence of heterogeneous traders (applying different trading strategies) naturally leads to generating time series with statistical characteristics resembling those of real financial markets. Furthermore, agent-based computational finance studies are often underpinned on the interpretation of financial markets as evolving systems. One of such study tries to explain when and why the continued existence of technical trading can be reconciled with the efficient market hypothesis<sup>14</sup>. Basing on the above, we strongly believe that systematic scientific studies of technical analysis should contribute to changing the paradigm of financial economics.

### ***3. Similarities between ethnopharmacology and scientific study of technical analysis***

Analogical reasoning is based on similarities between two things in some respects. These similarities make probable the assumption that they are also similar in some further respect. The more similarities and the higher their relevance, the stronger is the reasoning. Below, we describe the following four similarities:

- a) folk science as a foundation,
- b) important role of statistical study in designs,
- c) popularity resulting in big markets created around both folk medicine and technical analysis practice,
- d) one of possible sources of scientific knowledge in their disciplines (pharmacology and financial economics).

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<sup>14</sup> N. Ehrentreich, Technical Trading in the Santa Fe Institute Artificial Stock Market Revisited, Journal of Economic Behavior and Organization, forthcoming, 2006

The similarity with a key relevance for the whole reasoning is that both ethnopharmacology and scientific study of technical analysis are based on folk science. The occurrence of this similarity has some further consequences. For example we have to be aware that most claims made by practitioners of both folk medicine and technical analysis are false according to scientific standards. Therefore a lot of scientific skepticism is needed during scientific verification of such claims.

In ethnopharmacology, as in pharmacology in general, there is a common source of potential statistical bias in research, namely placebo effect. In the scientific study of technical analysis, there is a very serious threat of bias resulting from data-snooping. Therefore, in both cases there is a need for a research procedure that leads to outcomes not influenced by the statistical biases.

Today, the practice of folk medicine in western countries as well as the practice of technical analysis are very popular and create multi-billion dollar businesses. For example, a lot of dietary supplements are based on herbalism and its claims. There are also a lot of books, web sites, advisors and software concentrating on the technical analysis. These facts create pressure from business communities for positive scientific verification of claims made by practitioners in the both fields. Thus a special emphasis on ethical issues is needed.

In both cases, folk science is one of the possible sources of scientific knowledge. In ethnopharmacology the alternative path to drug discovery is systematic screening<sup>15</sup>. In financial economics, instead of basing on technical analysis practice, we can formulate testable predictions of market inefficiency based directly on behavioral finance or other non-neoclassical finance theory. Moreover, we can even feed the AI software (e.g. neural networks) with different input data and check whether predictions made by computer are able to consistently ‘beat the market’.

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<sup>15</sup> G. Balansard, *Ethnopharmacology: Traditional Medicines and Drugs of the Future, Methods and Findings in Experimental and Clinical Pharmacology*, Vol. 26, Suppl. A, 2004

Thus, both pharmacology and new paradigm of financial economics can develop without referring to folk science. However, this fact should not lead to overlooking potential benefits of studying folk claims.

#### ***4. Differences between ethnopharmacology and scientific study of technical analysis***

Among many, more or less obvious, differences between ethnopharmacology and scientific study of technical analysis, we would like to mention only three:

- a) ethnopharmacological methodology is much more developed than the one of technical analysis studies,
- b) research in ethnopharmacology is unlikely to lead to any change in the paradigm of pharmacology, while it seems quite possible that scientific study of technical analysis will contribute to, at least, modifying the current neoclassical paradigm in financial economics,
- c) folk medicine is stable, i.e. indigenous drugs of traditional cultures remain the same and ethnopharmacology has just to discover and then research them, while technical analysis is still evolving and new methods or new variations of the old ones keep emerging in the literature.

The first difference explains why in the paper we try to formulate some useful hints for scientific studies of technical analysis on the basis of ethnopharmacology and not the opposite. It is also important to notice that the methodology of ethnopharmacology was developed not only within this sub-discipline, but it was formed in the process of development of the whole medicine.

The second of the above differences could be interpreted as a premise leading to a conclusion that the role of scientific inquiry of technical analysis for financial economics is greater than the role of ethnopharmacology for pharmacology. The interpretation is supported by the fact of currently

different stages of development of both sciences. Pharmacology is now in the stage of ‘normal science’ in the Kuhnian sense, while financial economics is in the stage of paradigmatic debate. In the current stage of financial economics, each new path of research could potentially have a large influence on a future paradigm of the discipline.

The third difference indicates that there is always a chance that a new interesting concept, or only a new source of inspiration, will emerge in the technical analysis literature. Moreover, we can even expect a kind of feedback between science and practice of technical analysis – scientific papers should raise interest in a certain technical analysis method and perhaps lead to its development and new variants.

##### ***5. Lessons from ethnopharmacology for scientific study of technical analysis***

The general lesson from ethnopharmacology is that studies of folk science can be scientifically fruitful. Thus, ethnopharmacology should prompt financial economists to reconsider their attitudes toward technical analysis.

The initial step for systematical studies of technical analysis should be developing proper methodology. In medical sciences, there is a well-grounded methodology of drug evaluation. Methodological framework used to assess health outcomes is called evidence-based medicine. ‘Evidence-based medicine categorizes different types of clinical evidence and ranks them according to the strength of their freedom from the various biases that beset medical research. For example, the strongest evidence for therapeutic interventions is provided by randomized, double-blind, placebo-controlled trials involving a homogeneous patient population and medical condition’<sup>16</sup>. Moreover, there are also ranks of substances recommendations classified by the balance of risk versus benefit of the substance and the level of evidence on which this

information is based. We recommend to create within scientific study of technical analysis analogical methodological framework to the evidence-based medicine. It should help to establish scientific rules of research in the field as well as rank different methods according to their level of evidence. The idea is not ours as there is even a book by David R. Aronson titled Evidence-Based Technical Analysis: Applying the Scientific Method and Statistical Inference to Trading Signals<sup>17</sup>.

As indicated above, while in pharmacological research the most common source of bias is a placebo effect, in technical analysis studies serious biases can be caused by data-snooping. With data-snooping biases correspond our feeling that in current scientific studies of technical analysis there is too little effort to explain mechanisms underlying the occurrence of market inefficiencies, as, in most cases, papers document only statistical evidence. It is also worth noticing that the explanation mechanism can take the form of self-fulfilling prediction, but obviously, such conclusion has to be based on adequate premises.

Perhaps, for a systematic research program on testing technical analysis it would be beneficial to create a peer-reviewed journal devoted to the field. It would support a focused and lasting dialogue on the issue and should help to contribute to develop a common framework for studying efficiency of technical analysis with scientifically rigorous methodology. As mentioned above, technical analysis practice creates a multi-billion dollar business, so there is a need that the journal was independent from influences of stakeholders interested in publishing only positive results.

An important hint from ethnopharmacology is also the observation that even if original claims made by practitioners of folk science are of no scientific value, they can be an inspiration for

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<sup>16</sup> [http://en.wikipedia.org/wiki/Evidence\\_based\\_medicine](http://en.wikipedia.org/wiki/Evidence_based_medicine)

making a valuable discovery. As an example from pharmacology can serve a situation in which plant claimed to be useful for a certain disease turns out to be useful for a different one. Even in hitherto studies of technical analysis we have an example of a discovery inspired by market technicians' claims without verifying the claims themselves<sup>18</sup>.

One more lesson from ethnopharmacology is that folk science, instead of being potentially useful source of scientific knowledge in a given discipline, is interesting from the point of view of other social sciences (anthropology and sociology). Journal of Ethnopharmacology welcomes contributions from anthropology. It seems that scientific studies of technical analysis should also include sociological papers, like the one by M. Mayall<sup>19</sup>.

### ***Conclusions***

The analogical reasoning presented in the paper is aimed at proposing a systematic research program potentially fruitful for the current paradigmatic debate in financial economics as well as formulating some useful hints regarding a way of conducting such research.

In the paper, we presented an analogy between two seemingly distant fields of research – ethnopharmacology and scientific study of technical analysis. The main similarity on which this analogy is based is the fact that both approaches have their foundations in folk science. After briefly presenting both fields of study, we enumerated more similarities, such as: importance of statistical study designs, popularity of folk science practices (folk medicine and technical analysis) leading to multi-billion dollar businesses, folk science is one of the possible sources of scientific knowledge. Obviously, above two fields also differ. We briefly described three

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<sup>17</sup> D.R. Aronson, Evidence-Based Technical Analysis: Applying the Scientific Method and Statistical Inference to Trading Signals, Wiley, November 2006

<sup>18</sup> H A. Kavajecz , Technical Analysis and Liquidity Provision, The Review of Financial Studies, Vol. 17, Issue 4, 2004, pp. 1043-1071

differences: higher development of ethnopharmacological methodology, only scientific studies of technical analysis are likely to influence the paradigm of a scientific discipline, technical analysis methods are still evolving while folk medicine practices are stable. The meaning of presented analogy results mainly from the lessons for financial economists that could be drawn from such a developed discipline as ethnopharmacology. We indicated five such practical lessons potentially helpful for studies technical analysis: believe that the studies are scientifically fruitful, see a need for a broadly accepted scientific methodology, consider establishing a peer-reviewed journal devoted to the field, regard technical analysis practice not only as a source of claims which has to be scientifically verified but also as a rich source of inspiration, interest sociologists with technical analysis studies.

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<sup>19</sup> M. Mayall, "Seeing the Market": Technical Analysis in Trading Styles, *Journal for the Theory of Social Behaviour*, Volume 36, Number 2, June 2006, pp. 119-140

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