Efficient Markets, Value Neutrality and Symmetric Maximum Entropy Principle

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Abstract
We study the relationship between efficient markets, value neutrality and symmetric maximum entropy principle. We find that the efficient market is in the state of maximum information entropy, which means that market prices fluctuate randomly, that value neutrality is in the state of maximum value entropy, and that information symmetry can lead markets to reach efficient outcomes, while the symmetry of resource allocation is bound to lead to value neutrality, both of which mean they are in a symmetric maximum entropy state.

Keywords: Efficient Markets, Value Neutrality, Maximum Entropy, Information Symmetry, Symmetry of Resource Allocation

1. Introduction
Resources include matter, energy and information. Economic systems and resource allocation are related to exchange. Without exchange, there would be no currency and price. A market system is a way to realize the exchange and allocation of resources. The exchange and allocation of resources are of course inseparable from information.

Fama coined the terms "market efficiency" and "efficient markets". They first appear in "Random Walks in Stock Market Prices," paper number 16 in the series of Selected Papers of the Graduate School of Business, University of Chicago, reprinted in the Financial Analysts Journal [1].

Fama showed that it is very difficult to predict asset-price movements in the short run, because markets incorporate any new price-relevant information very quickly. This finding came to be known as the efficient market hypothesis.

Economic output is the most important measure of the economic process, and the cost-adjusted economic output is an important criterion for measuring the efficiency of the economic process and constitutes the most important measure of economic value.

The process of economic output is realized by the economic organization, and the economic output of course requires the input of resources. If the same resource inputs have the same economic output and economic value, then the value is neutral.

In this paper, we study the relationship between efficient markets, value neutrality and symmetric maximum entropy principle.

We find that the efficient market is in the state of maximum information entropy, which means that market prices fluctuate randomly, that value neutrality is in the state of maximum value entropy, and that information symmetry can lead markets to reach efficient outcomes, while the symmetry of resource allocation is bound to lead to value neutrality, both of which mean they are in a symmetric maximum entropy state.

2. The Efficient Market is in the State of Maximum Information Entropy
The efficient market hypothesis, alternatively known as the efficient market theory, is a hypothesis that states that share prices reflect all available information. Therefore, the efficient market theory is a holographic theory. In addition, the efficient market is in the state of maximum information entropy. Because, if not, there must be a state of ordered information, but this ordered information is contained in the current information set, which is reflected by the current price. Therefore, this state of ordered information actually does not exist. This also shows that the efficient market is in equilibrium [2]. The state of maximum information entropy of the efficient market means that the efficient market is a disordered state, in which financial markets cannot participate [3].

Information symmetry, which means by definition "A condition in which all relevant information is known to all parties involved", is conducive to the consistency of market expectations, which can lead markets to reach efficient outcomes. In this state, there should be no correlation between market price changes due to the disorder of maximum information entropy, which means that market prices fluctuate randomly.

3. Value Neutrality is in the State of Maximum Value Entropy

The process of economic output is realized by the economic organization, and the economic output of course requires the input of resources. If the same resource inputs have the same economic output and economic value, then the value is neutral. The concepts of value neutrality and efficient markets are actually quite similar. Value neutrality is in the state of maximum value entropy, that is, a state of value disorder. Because, if not, there must be a state of ordered value, that is, there is some economic output and economic value that is greater for the same resource input, but when the value is neutral, the economic output and economic value obtained from the same resource input are the same, which means that this state of ordered value does not exist.

4. Efficient Markets, Value Neutrality and Symmetric Maximum Entropy Principle

In my article "Communism, Value Neutrality, and Monetary Neutrality" there is a logical relationship [4].

Symmetry of resource allocation => value neutrality => monetary neutrality => purchasing power parity equilibrium.

There is also a logical relationship in my article "Symmetry, Efficient Markets and Monetary Neutrality" [5].

Information symmetry => efficient markets => monetary neutrality => purchasing power parity equilibrium

If the microscopic entities of a system are symmetrical based on a certain attribute, it must mean that the system is in the maximum entropy state of this attribute. This is called the symmetric maximum entropy principle. For example, information symmetry inevitably means that the system is in the state of maximum information entropy, while temperature symmetry inevitably means that the system is in the state of maximum thermal entropy [6,7]. Therefore, the previous part of these two articles is a symmetric maximum entropy state, and monetary neutrality is actually the law of conservation of output.

Symmetric maximum entropy principle means that order leads to microscopic symmetry breaking. When resources are allocated symmetrically, the whole system is a disordered state according to the principle of symmetric maximum entropy. Asymmetric resource allocation may lead to order. Money is the medium of resource exchange, and the world of money is difficult to be without order when there is order in the world.

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