Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
Physica A 324 (2003) 278–284
PHYSICA A
www.elsevier.com/locate/physa

The internalist perspective on inevitable arbitrage in financial markets

Koichiro Matsuno*

Department of Bioengineering, Nagaoka University of Technology Nagaoka 940-2188, Japan

Abstract

Arbitrage as an inevitable component of financial markets is due to the robust interplay between the continuous and the discontinuous stochastic variables appearing in the underlying dynamics. We present empirical evidence of such an arbitrage through the laboratory experiment on a portfolio management in the Japan–United States financial markets over the last several years, under the condition that the asset allocation was updated every day over the entire period. The portfolio management addressing the foreign exchange, the stock, and the bond markets was accomplished as referring to and processing only those empirical data that have been complied by and made available from the monetary authorities and the relevant financial markets so far. The averaged annual yield of the portfolio counted in the denomination of US currency was slightly greater than the averaged yield of the same physical assets counted in the denomination of Japanese currency, indicating the occurrence of arbitrage pricing in the financial markets. Daily update of asset allocation was conducted as referring to the predictive movement internal to the dynamics such that monetary flow variables, that are discontinuously stochastic upon the act of measurement internal to the markets, generate monetary stock variables that turn out to be both continuously stochastic and robust in the effect.

Keywords: Arbitrage; Discontinuous dynamics; Internal measurement; Portfolio management

1. Introduction

Portfolio management does require the activity of predictions in one form or another. However, if the financial markets processing the actual transactions are complete and perfect in themselves, every prediction on the part of the market participants has already

* Tel.: +81-258479420; fax: +81-258479420.
E-mail address: kmatsuno@vos.nagaokaut.ac.jp (K. Matsuno).

0378-4371/03/$ - see front matter
doi:10.1016/S0378-4371(02)01841-1

been interwoven into the spot and the future prices of whatever financial commodities to be transacted there. This may suggest that predictions might be superfluous as a technical term. At the same time, once one raises the question of how the predictions could be interwoven into the prices, it would turn out that the activity of making predictions on the part of the market participants remains inseparable from one more activity of forming the prices of the financial commodities from within the markets. The movement of the markets for forming the prices of the financial commodities goes along with the activity of measuring and predicting the movement itself from within. At the least, every market participant is required to act so as to avoid any functional disorder in the markets including its own bankruptcy. Surviving market participants necessitate both the activities of measurement and of prediction internal to the markets for the sake of their own survival.

In particular, once it is admitted that the activity of forming the prices of the financial commodities has recourse to the measurement internal to the markets, such an internal measurement exhibits a marked contrast between before and after the actual deed of measurement [1,2]. Measurement introduces a discontinuous cut between the prior indefiniteness and the posterior definiteness. What is more, since such a discontinuous cut does not specify in advance how the discontinuity could be introduced after all, internal measurement turns out to be a discontinuous stochastic event. Discontinuous stochastic events do not presume any stationary relationship between the actual measurement of an economic variable and its statistical expectation value, as embodied in the martingale property. Nor do discontinuous stochastic events reduce to a continuous stochastic process as with the case of Wiener process or Brownian motion.

In the empirical arena, on the other hand, there is certainly a set of quantitative figures distinguishing between continuous and discontinuous stochastic variables. An example is the contrast between monetary stock and flow controlled by each market participant. Monetary flows vary discontinuously, while monetary stocks vary only continuously as observing that the total currency in circulation in the markets is equal to and continuous to the total banknotes issued by the central bank. Discontinuity in monetary flow rests upon the simple fact that changes in monetary flow happen to occur through changes in the discrete categories of asset and liability in currency risk management on the part of each market participant. Unless discontinuous changes in the time-structures of asset and liability are available, there could be no changes in monetary flows in the markets. Changes in monetary flow could not actualize unless the act of its categorical specification, that is intrinsically discontinuous in separating between before and after its actual implementation, is preceded. Although the stock variables appearing in the balance sheet in bookkeeping must be continuous in observing that both ends of asset and liability meet, currency risk management intended for making both ends meet becomes possible only through changing the time-structures of asset and liability in a discontinuous manner.

Discontinuous changes in monetary flow can then come up with continuous changes in monetary stock in the effect. In particular, internal predictions on the part of every market participant necessarily go along with discontinuous changes in monetary flow. This is because currency risk management, which is indispensable for making both ends of asset and liability meet through bilateral transactions on the part of any market