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# The Bagsik Oscillator without complex numbers

Jerzy Przystawa<sup>a,\*</sup>, Marek Wolf<sup>a,b</sup>

<sup>a</sup>*Institute of Theoretical Physics, University of Wrocław, pl. Maxa Borna 9, 50-204 Wrocław, Poland*

<sup>b</sup>*School of Management and Finance, ul. Pabianicka 2, 53-339 Wrocław, Poland*

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## Abstract

We argue that the analysis of the so-called Bagsik Oscillator, recently published by Piotrowski and Śładkowski, is erroneous due to: (1) the incorrect banking data used and (2) the application of statistical mechanism apparatus to processes that are totally deterministic. © 2002 Elsevier Science B.V. All rights reserved.

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## 1. Introduction

Interest-rate parity relationship (IRP) is a formula which relates the time dependence of the exchange rates of two different currencies to the difference of the interest rates in the corresponding countries [1]. If the IRP relationship is violated, then an arbitrage opportunity arises. It is not unusual for some governments and/or central banks, pursuing some particular political or/and economical goals, to interfere with IRP, and manipulate the exchange rates or interest rates or both. Such manipulations inevitably lead to massive flows of currencies in one way or the other (e.g. Ref. [2]). A particularly drastic example of such a manipulation can be found in the recent history of Poland, where, in the year 1990, the Government decided to freeze, for a long time (it lasted for about two years), the foreign currency exchange rate on the level of 1 US\$ to ca. 10.000 zloty, while keeping the bank interest rates many times higher, even in the order of magnitude, than those in the Western banks [3]. In our previous publication [4], we presented a scheme of exploiting these opportunities, consisting of repeated chain

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\* Corresponding author.

*E-mail addresses:* przystaw@ift.uni.wroc.pl (J. Przystawa), mwolf@ift.uni.wroc.pl (M. Wolf).

of steps: a foreign loan—exchange of currencies—deposit-loan—exchange deposit, etc. This simple scheme led to many enormous fortunes made by various groups of individuals, of which the best known examples in Poland were the so-called “Art.B affair” (“The Bagsik Oscillator”) and “the FOZZ-gate” [2]. To demonstrate the efficiency of those financial speculations we carried out model calculations assuming that the difference of the interest rates between the rates for deposit rates in Polish banks and those in the West amounted to 70% p.a. throughout the year 1990.

In a polemical article recently published by Piotrowski and Sładkowski [5], criticism was expressed that our model of the Bagsik Oscillator was “oversimplified and unrealistic” and our conclusions are hasty and unjustified.<sup>1</sup> The criticism may be summarized in three points. (1) They maintain that the bank interest rates were at that time much lower than those assumed in our model calculations and the difference between the Polish rates and those in the West did not exceed 30%. (2) Using their previously published “thermodynamics of portfolios” [6] and their data of the bank interest rates they came to the conclusion that with such interest rates the mechanism described in our paper [4] would lead to no profit at all. (3) The Authors claim that there have been in operation much more efficient, *by four orders of magnitude*, schemes of making fortunes.

In what follows we show that their criticism is unfounded.

## 2. Interest rates

As far as the Polish National Bank’s interest rates are concerned, Piotrowski and Sładkowski refer to an information in Donosy (an Internet news bulletin) [7] and quote that “at the beginning of the year 1990 (2nd of January) the interests rates of demand deposits were at the level of 7% a year and the three-years deposits—38%”. This quotation is a misunderstanding. Our critics simply overlooked that the rates they are referring to were *monthly* rates and not the rates per annum. In Ref. [7], it is clearly stated that the interest rates are to be determined each month and at the beginning for the month of January 1990 it is established at 36% per month. To be on the safe side, we propose to consult not an internet private newsletter like “Donosy”, but an official document issued by the Polish National Bank [8]. The Decree no. 19/89 of the President of the Polish National Bank of the 30th December 1989 orders that since the 1st of January 1990, the interest rates should be 36% per month. We have tracked down all changes of the rates during the year 1990 and they are presented in Table 1.<sup>2</sup> Fig. 1 represents the value of 1 zloty deposited on the 1st of January 1990 and subjected to the rates in Table 1. It is seen from this figure that 1 zloty deposited at the beginning of 1990 increased to 2.23 by the end of that year. This corresponds

<sup>1</sup> The same article, in its Polish version, has been subsequently presented on the internet (<http://alpha.uwb.edu.pl/ep/sj>) and reprinted in a book of one of those authors at <http://alpha.uwb.edu.pl/ep/RePEc/sla/eakjkl/69PL.pdf>.

<sup>2</sup> Table 1 was compiled from LEX, the legal acts database, see [www.lex.pl](http://www.lex.pl) (Legal Publishing House LEX, Sopot).

Table 1

| Period            | Rate       |
|-------------------|------------|
| 1.01.–31.01.90    | 36%/month  |
| 1.02.–28.02.90    | 8%/month   |
| 1.03.–31.03.90    | 10%/month  |
| 1.04.–30.04.90    | 8%/month   |
| 1.05.–31.05.90    | 5.5%/month |
| 1.06.–30.06.90    | 4%/month   |
| 1.07.–30.09.90    | 34%/yr     |
| 1.10.–20.11.90    | 43%/yr     |
| 21.11.90–31.12.90 | 55%/yr     |

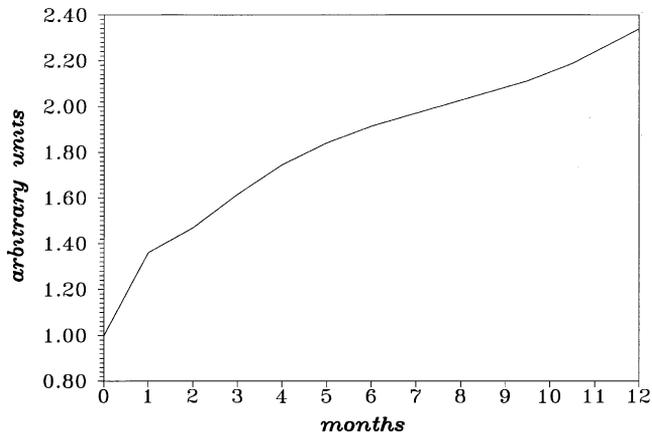


Fig. 1. Deposited (in Polish zloty) capital growth throughout 1990.

to an effective rate of 134% p.a. In fact, real deposits were at lower rates but the rate 80% p.a. which we assumed for simplicity was not an exaggeration. Incidentally, a deal that Bagsik struck with the Polish State Bank PKO BP by the end of 1990, when he deposited 600 billion zloty (equivalent of 60 million US\$) for 5 yr, had been made on assumption that current interest rates were on a level of 80% p.a. [9].

### 3. “Temperature” of the Bagsik Oscillator

In their article [6], Piotrowski and Stądkowski developed a thermodynamic analogy of financial market games. In their formalism they introduced the notion of temperature and in the article [5] they proposed a simple measure of the profitability of such market games. The criterion they proposed is that if the temperature is negative then the game is not profitable. They applied that apparatus to our Bagsik Oscillator model assuming the difference of the interest rates to be 30%. They calculated the “temperature” of the oscillator and since this temperature turned out to be negative they concluded that

our scheme of making fortunes, if analysed in “realistic terms” (i.e. with the difference of the interest rates to be 30%, not 70% as in our calculations) was not profitable at all.

Such reasoning is erroneous. Statistical mechanics can be applied to statistical processes and random variables are essential. The process we had described in our article [4] was totally deterministic and there was nothing random in it. Each loop of the Bagsik Oscillator led to riskless profit and everyone who had an understanding what is the meaning of a huge deviation from the IRP, as was the case of Poland, was in a position to exploit it and make a huge profit.

No complex numbers and no “temperatures” are needed to visualize that. Consider Bagsik’s deal mentioned above [9]. By the end of 1990 Bagsik had deposited an equivalent of 60 million US\$ for 5 yr. With the interest rates at a level of 80% p.a. it would lead to the multiplication of the deposited capital to about 50 times. With a bank certificate to the amount equivalent to 3 billion US\$ one could play any financial game one pleased. So, it is no wonder that Bagsik and Gasiowski could flee Poland, half a year later, with nearly half a billion US\$ in cash. But suppose that the interest rates at that time were not 80% but 40% as Piotrowski and Sładkowski would prefer. In such a case a certificate possible to obtain from the Polish State Bank would amount to not 3 billion US\$ but to a figure 10 times lower. How big a loan one could obtain for a state bank certificate amounting to 300 million US\$? Whatever be the answer to this question every loop of the “oscillator”, i.e.: exchange—deposit in Poland—exchange, would lead to 30% p.a. gain. Since Piotrowski and Sładkowski come up with a “negative temperature” for such a procedure it can only mean that their “thermodynamics” does not apply to such processes at all.

In fact, the inventors of the “oscillator” revealed their secrets themselves (see Ref. [10, p. 59]). They also gave it an imaginative name: “B.G. Moneytron” (B&G for Bagsik and Gasiowski). In their words it consisted of repeated “loan-deposit oscillations within the framework of an international arbitrage”. In the same place they boast that this “moneytron” resulted in magnification of the invested capital by 18000% within 1 yr.

#### **4. P&S 1.93 Oscillator**

In Ref. [5], Piotrowski and Sładkowski (P&S) come up with a sophisticated scheme of making fortunes in the realities of the beginning of the last decade in Poland, which they call “sbO 1.93”. The essence of their “oscillator” was to exploit hyperinflation of those years, which, according to their data, amounted to nearly 600% for non-edible goods and to nearly 800% for services. Speculators could then, say at the beginning of the considered period, purchase sufficient amount of goods and/or services, by making due payment deferred till the end of the period, make enormous profits. By repeating such “oscillations” a number of times, one could generate a profit by five orders of magnitude (“45 000 times”) bigger than the one that could be generated within the framework of the above-described “B.G. Moneytron”.

Although in times of reeking inflation (3 or even 4 digits) it would be hard to imagine contractors who would agree to the payment deferred for a prolonged amount of time, we are not ruling out such a possibility. P&S suggest that “one could induce directors of state-owned firms to enter such formally legal but tragic in effects contracts” and perhaps cases of such contracts are known to them. The difference with what we were discussing in our former article is that an access to the “B.G. Moneytron” was open to everyone who had an understanding of what the interest-rate parity meant and to a substantial loan or credit. No conspiracy (e.g. no “inducement” of directors, etc.) was needed.

The criticism of P&S has missed the point of our article [4]. Our intention was to point out what appalling consequences could be of violation of the IRP. Nowhere we claimed that the mechanism described in Ref. [4] could not be surpassed by other crafty arbitrage schemes, like the one suggested by P&S. It is, however, worth to note that the latter could be exploited only in special circumstances of hyperinflation, the arbitrage based on marked deviation from the IRP relationship has been, and still is, used more often all over the world. The case of the recent crisis in Argentina may serve as another good example.

## 5. Concluding remarks

Problems of previously closed economies, like those of the former communist countries, are abundant. Incompatibility of financial mechanisms operating there with those normal for free markets made them exposed to easy games, to various forms of arbitrage, which people of these countries had no means of understanding and therefore were unable to oppose effectively. Some of such games were simple enough and to understand them no functional analysis, complex numbers or statistical physics are really needed. We were trying to show that the so-called Bagsik Oscillator belonged to the latter category.

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