Cost of Capital Management by the central Bank in Czech Banking System: The Cybernetic Approach

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Abstract
The paper is devoted to the Czech banking system, understood as a cybernetic system. The focus is to the cost of capital management.
The aim of the paper is analysis and evaluation relations between the managing system (controller – central bank) and managed system commercial banks) as relationships between operational indicator (discount/REPO rate) and regulated indicator (commercial rates).
Methodology of the paper is strategically focused to application methods of economic cybernetics. The usual analytic-synthetic methods, literary research, description and comparison are used here as well.
The main expected results of the paper are conclusions related to the fundamental linkages between discount/REPO rate and the commercial rates and to the real control potential oft the CR central bank in this area consequently.

JEL classification: C67, E58, G21
Keywords: banking system, cost of capital, cybernetics

1. Introduction

There is still the opinion between the financial theorists that the market interest rate is highly influenced by the central bank by discount and REPO rates. „The main aim of discount rate … caused by central bank … is affection of movement, resp. of other interest rates level in economy and therefore influence on subjects' loans demand." (Revenda, 1999) and „ ….. it is expected that the central bank may/can influent interest rates of client loans relatively well influence through the development of REPO rate." (Revenda, et al., 1999).

This paper is therefore focused to analysis of the Czech National Bank (regulator – control element) and the system of commercial banks (controlled system) as relationships between operational indicator (discount and REPO rate) and regulated indicator (commercial rates).

The main aim of the paper is therefore the analysis of discount and REPO rate impact on market interest rate. To reach this aim there will be investigated following problem areas:

a) fundamental applicability of cybernetic approaches in selected area,
b) rationality of the Czech banking system as a cybernetic one and
c) linearity and regulation accuracy of the Czech banking system.

2. Methodology and Data

The discount and REPO rates influence on market interest rate is in this paper conceptualized as a communication and management problem. Therefore it is suitable to

apply methodical apparatus of theoretic discipline in these terms that was in the Czech Republic used for these intensions only marginally – "cybernetics … as a science about general laws of origination, transmission and processing of information in complex systems ….. ." (Kubík et al., 1982).

2.1 Methodology

From methodical instruments of cybernetics (more exactly of technical cybernetics) there will be further used:

- static function (Kubík et al., 1982),
- theory of hysteresis function (Švarc, 2003).

The area in which we are applying these methodological tools is usually designated as „economic cybernetics" (Švarc et al., 2011).

As parts of the paper methodical apparatus are except above mentioned techniques also used description and common analytically-synthetic procedures.

2.2 Model specification

The real-life object which we are modeling is the banking system of the Czech Republic. We shall model the processes of managing the cost of capital at a business level (commercial rate) through the use of the discount and REPO rate. The model for this real-life system is the static characteristics (Fikar and Mikleš, 1999).

The relative simplicity of the model used does not prevent it from being used for primary identification, for acquiring the indicative characteristics of the analyzed system (ibidem).

2.3 Data

This paper draws on data published by the Czech National Bank (CNB) at http://www.cnb.cz, to which we link here (because of range reduction). The exact addresses are listed in References.

In data and results presentation here are the graphic outcomes preferred because of the data extent. These data cover time period from 31st January 2004 to 30th August 2013.

The cybernetic approach requires data in stabilized state. "Static characteristics of control members are mostly expressed by the static function, i.e. the dependence between the output indicator in stabilized state and entry indicator in stabilized state." (Švarc, 2003). That means, according to our expert opinion, the values constant during the time period long at least three months. This view is supported (using the regression) by source Šerý (2010).

3. Results and Discussion

3.1 Fundamental applicability of cybernetic approach in economic area

The source Allen (1971) emphasizes in these terms unequivocal opinion: „There is necessary only the formal similarity to anticipate that the methods used in technology (engineering) will be suitable for economic models too." This condition is met in our case.

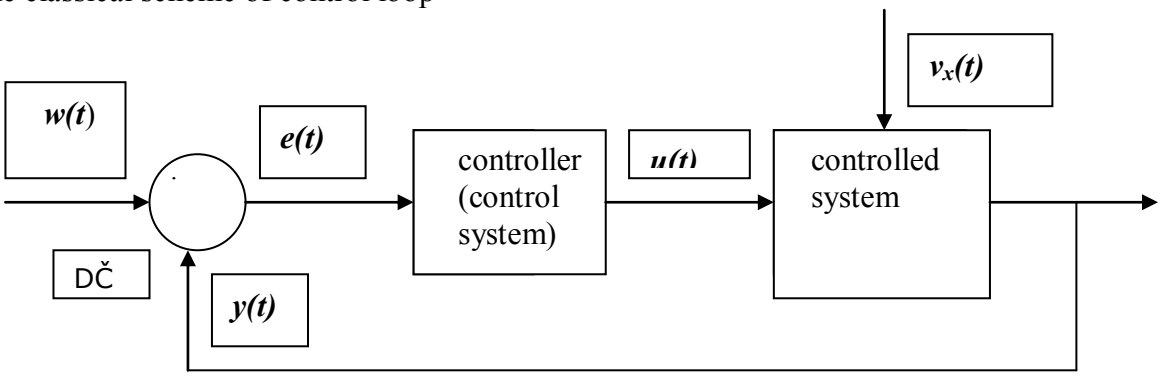
Nevertheless, the same source mentions an important problem with application of methods that have been successfully proved in technical sphere on the economic sphere – the linearity of the models. „Linear models can be generally suitable for technology (engineering) where everything can be accurately managed. Be sure that they are not suitable up to the same extent for the economic models." However, there is accepted the possibility of linearization.

3.2 Rationality of the Czech banking system as a cybernetic one

The study of this phenomenon brought the first interesting result. For its relevant interpretation there will be firstly described the concept of control loop in its classical form (see Figure 1).

Modification of the classical scheme of control loop for the influence of central bank official independence is obvious (see Figure 2). The system feedback is preserved indeed but its ability of target behaviour is in absence of command variable *w(t)* at least disputable.

Figure 1
The classical scheme of control loop

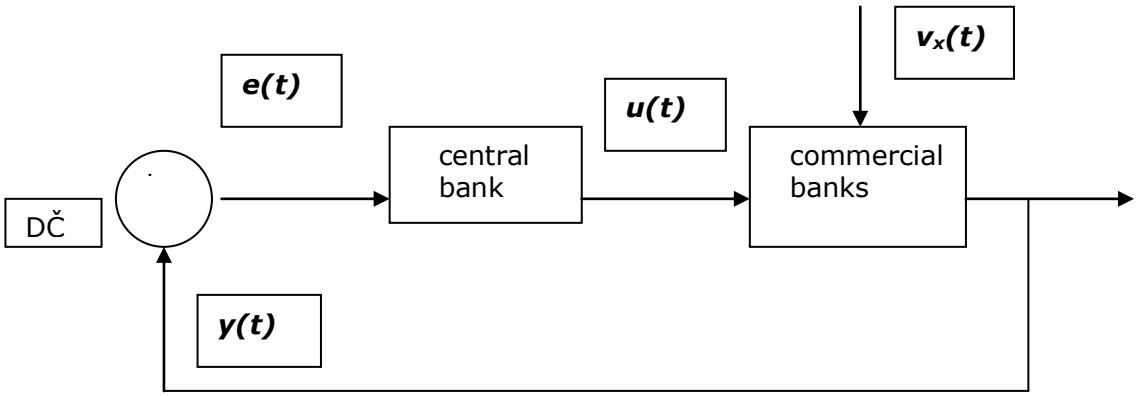


Source: Adapted from Švarc et al. (2011, pp. 62-65).

Notes:

w(t) …… command variable	– unknown indicator, it cannot be interpreted
e(t) ……error	- - „ -
u(t) …… manipulated variable	- discount rate
$v_x(t)$ …… disturbance variables	- are recognized as a part of ceteris paribus assumption
y(t) …… controlled variable	- commercial rate / rates
DČ …… differential element ($e=w-y$)	- unknown component, it cannot be defined

Figure 2
The modification of control loop – consequence of central bank independence



Source: Own construction of the author based on Švarc et al. (2011, pp. 62-65).

Notes:

e(t) ……error	- - „ -
u(t) …… manipulated variable	- discount rate

$v_x(t)$ …… disturbance variables - are recognized as a part of ceteris paribus assumption
$y(t)$ …… controlled variable - commercial rate / rates
DČ …… differential element ($e=w-y$) - unknown component, it cannot be defined

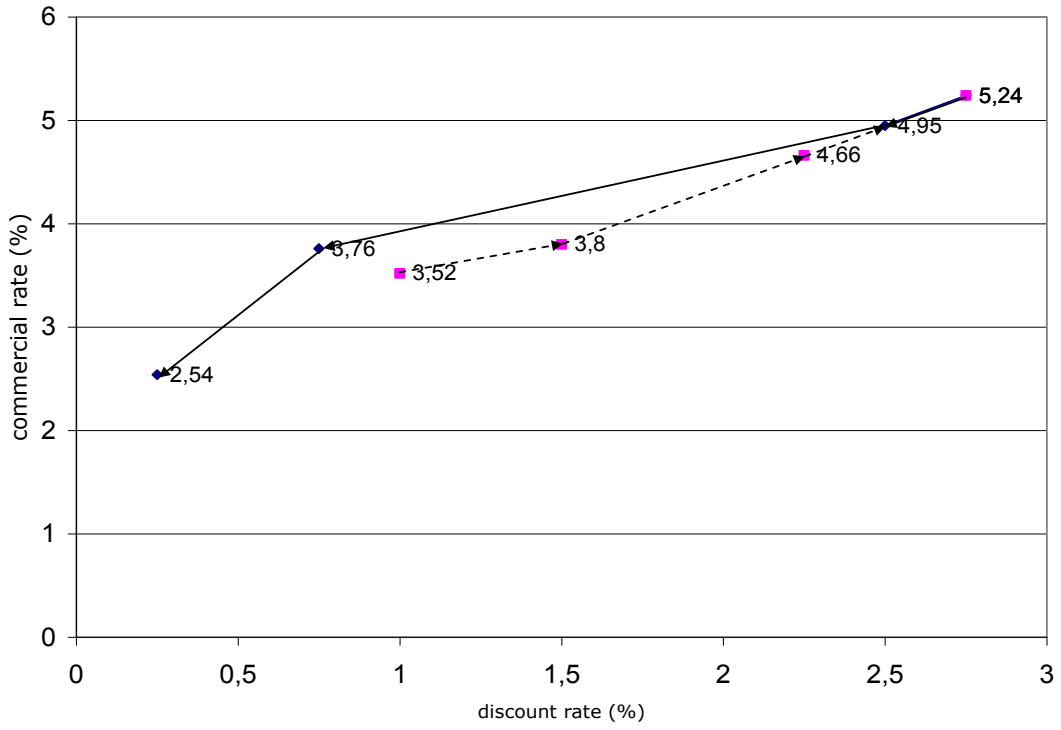
It is even possible to express more radical conclusion – entire absence of command variable makes this control loop dysfunctional. That is the reason why there arises the obvious need to substitute the officially non-existent command variable by its equivalent. That is probably possible in the form of informal organizational structures built in the Czech banking system as well as beside it. It is in interesting way proved by typing error of the source (Revenda, 1999). „The main aim of discount rate changes … from the side of central bank (government) is *to influence progression,* resp. *the level of other interest rates* ... and therefore to affect the demand ... for loans."

3.3 Linearity and regulation accuracy of the Czech banking system (static function)

"Static characteristics of control members are mostly expressed by the static function, i.e. the dependence between the output indicator in stabilized state and entry indicator in stabilized state." (Švarc, 2003). That means the values constant for our purposes during the time period long at least three months.

Interaction between central bank and commercial banks on the case of discount rate leads to negative synergies when in the static characteristic occurs the non-linearity of the hysteresis type (see Figure 3). This state eventuates in conclusion that announcement effect of discount rate gradually erodes. In its implications it means that after certain cycles "increase-decrease" of the discount rate this ratio (discount rate) will lose its ability to regulate commercial rate.

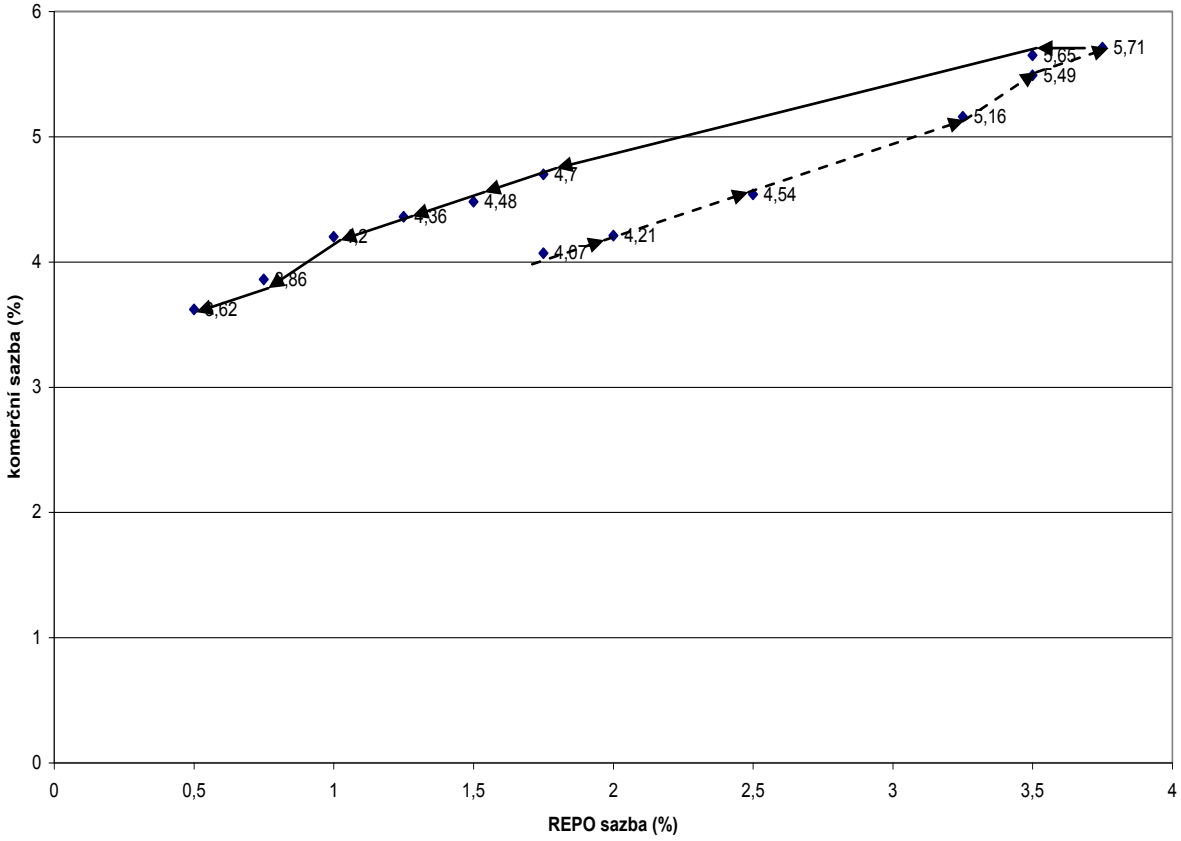
Figure 3
Discount rate - the hysteresis erosion ability to regulate of the commercial rate



Source: Own construction of the author.

In the next step we are analyzing the reactions of the system in case that the REPO rate changes (see Figure 4).

Figure 4
REPO rate - the hysteresis erosion ability to regulate of the commercial rate



Source: please provide a source website, paper, author's calculations, etc.

Interaction between central bank and commercial banks leads even in this case to negative synergies when there the non-linearity of the hysteresis type occurs (see Figure 4). This state eventuates in conclusion that also the REPO rate is in fact not able to manage value of commercial rate. In its implications it means that after certain cycles of "increase-decrease" type the REPO rate will lose its ability to regulate commercial rate.

4. Conclusions and policy implications

The paper conclusions are formulated in relation to above mentioned structure of partial analysed problem areas. There can be on the discussion basis formulated paper conclusions:

a) Fundamental applicability of cybernetic approach in economic area

Cybernetic approaches are for the settled task (inquiry into economic processes) undoubtedly utilizable. The possible problems with disputable linearity can be in the first approximation solved by linearization of tackled problem.

b) Rationality of the Czech banking system as a cybernetic one

The assumption of central bank independence leads to absence of command variable ***w(t).*** The Czech banking system appears at this state of affairs as the system with feedback but in

fact as the uncontrolled one. The possibilities of rational target behavior are in this case quite limited.

c) Linearity and regulation accuracy of the Czech banking system (static function)

Commercial banks conduct themselves as a linear system in principle. The nonlinearity of hysteresis type is typical for coexistence of central bank with commercial banks. The erosion of discount and REPO rates announcement effect is a result of this state. It can even lead to loss of applicability of both rates as cost of capital (bank loan) management instrument at the level of commercial rate. Present level of discount rate and REPO rate as well confirms this theoretic possibility in praxis.

The paper results are surprising in a certain manner. They theoretically confirm limited possibilities of discount and REPO rates as an instrument for regulation of cost of capital in the form of bank loan (market interest rate, commercial rate). In this relation there can be clearly seen possible similarity with the monobank management potential (de SOTO, 2009) even if there are taken into account all disadvantages resulting from this variant of banking sector organizational order (Revenda, 1999).

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