

# Intertemporal Equilibria in the Public Banking Sector in Turkey

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**Abstract.** This paper presents an intertemporal model and an empirical examination of service performance, and service quality in the public banking sector in Turkey, and shows that the sector in question is trapped into a stable intertemporal equilibrium characterized by mediocre levels of service performance and service quality. The model enables us to present an empirically-demonstrated solution to the problem of this mediocre performance-mediocre quality trap. Our suggested solution, which involves performance-enhancing productivity increases, helps the sector to move from the mediocre performance-mediocre quality equilibrium to a high performance-high quality equilibrium.

**JEL Classification Codes:** G10, G21.

**Key Words:** Intertemporal equilibria, banking sector.

## I. Introduction

The literature on the service sector in general and the banking sector in particular includes a rich spectrum of works including Babakus and Boller (1992), Boone, Lemon and Staelin (2001), Boulding, Kalra, Staelin and Zeithaml (1993), Bulton and Lemon (1999), Carman (1990), Caruana, Money and Berthon (2000), Cronin and Taylor (1992, 1994), Dasu and Rao (1999), Kara (2003), Kara, Tarım and Tatoglu (2003), Kara, Tarım and Zaim (2003), Kays, Kim and Shin (2003), Kopalle and Lehmann (2001), Oliver and Swan (1989), Parasuraman, Zeithaml and Berry (1985, 1988,1991), Rust and Zahorik (1993), Rust, Danaher and Varki (2000), Teas (1994), Yavas, Bilgin and Shemwell (1997).

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The issues covered by the literature range from the problems of service quality in emerging economies to complex relations among service quality, customer satisfaction and loyalty. As vast as the coverage of these works may be, the range of the intricate phenomena in the service sector is too rich and wide to have been fully covered by the literature. There are still many unresolved puzzles and problems in practice to be accounted for. We will identify and explore one of these problems involving a peculiar and pervasive trap locking the public banking sector into stable mediocre levels of service performance and service quality over time. This paper develops a model that theoretically and empirically demonstrates the equilibria characterized by mediocre performance and quality, and formulates a policy that moves the sector from a mediocre performance-mediocre quality equilibrium to a high performance-high quality equilibrium.

In the second section of the paper, we develop the model. The third section presents the empirical results. The policy implications are articulated in the fourth section. The concluding remarks follow in the fifth section.

## 2. The Model<sup>1</sup>

Consider a banking sector where banks provide a service, say  $x$ , to the customers.<sup>2</sup> Let  $P_t$  be the *service performance* at time  $t$ , the measurement of which is based on a questionnaire given in the Appendix B. Let  $R^p_t$  be the *repurchase intention* in the sector, which indicates the degree to which customers are willing to repurchase the service at time  $t$ .  $R^p_t$  depends on the *customers' expectation*,  $E_t$ , of service performance at time  $t+1$ , and the service quality,  $Q_t$ , at time  $t$ .

$$\text{i.e., } R^p_t = f(E_t, Q_t)$$

We assume that

$$E_t(P_{t+1}) = P_t.$$

Considering that service quality could (or would) depend on present and/or past service performances,

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<sup>1</sup> This model is based on Kara (2003).

<sup>2</sup>  $x$  could be either a single service or an aggregated proxy for a combination of services.

i.e.,

$$Q_t = z(P_t, P_{t-1}).$$

Thus,

$$R_t^p = f(E(P_{t+1}), z(P_t, P_{t-1})) = f^p(P_t, P_{t-1}).$$

That is to say, the repurchase intention is ultimately a function of performance.

Let  $R_t^s$  be the suppliers' *resale intention* in the sector, which indicates the degree to which suppliers are willing to "re-supply" the service at time t. Suppose that  $R_t^s$  depends on present and past performances,

$$\text{i.e., } R_t^s = f^s((P_t, P_{t-1})).$$

(The measurement of  $P_t, R_t^p, R_t^s, E_t, Q_t$  are based on a questionnaire given in Kara (2003)).

For analytical purposes, we assume that the repurchase and resale intention have the following forms:

$$\ln R_t^p = \alpha_0 + \alpha_1 \ln P_t + \alpha_2 \ln P_{t-1}$$

and

$$\ln R_t^s = \beta_0 + \beta_1 \ln P_t + \beta_2 \ln P_{t-1}$$

To theorize about the movements over time (i.e., the dynamic trajectory) of service performance, we will make the following reasonable assumption, which is compatible with the logic of the market process: It is the relative strength (or magnitude) of the repurchase intention compared to the resale intention that provides the impetus for the performance to be adjusted upwards over time.

Formally,

$$P_{t+1} / P_t = (R_t^p / R_t^s)^k, \text{ where } k \text{ is the coefficient of adjustment.}$$

Taking the logarithmic transformation of both sides, we get:

$$\ln P_{t+1} = \ln P_t + k (\ln R_t^p - \ln R_t^s).$$

We will call this the dynamic adjustment equation. Substituting the functional expressions (forms) for  $\ln R_t^p$  and  $\ln R_t^s$  specified above and rearranging the terms in the equation, we get,

$$\ln P_{t+1} + (k\beta_1 - k\alpha_1 - 1) \ln P_t + (k\beta_2 - k\alpha_2) \ln P_{t-1} = k(\alpha_0 - \beta_0),$$

which is a second order difference equation, the solution of which is provided in the appendix.

The solution in the appendix shows that the intertemporal equilibrium performance,  $P^*$ , is:

$$P^* = e^{(\alpha_0 - \beta_0) / [(k\beta_1 + \beta_2) - (\alpha_1 + \alpha_2)]}.$$

To study whether this intertemporal equilibrium performance is high or low, and whether it remains stable over time, we need to empirically estimate the parameters involved. This is done in the next section.

### 3. Empirical Analysis

- a) The sample:** Data for this study was gathered using a questionnaire, originally developed by Carman (1990). A few questions designed by Cronin and Taylor (1992) were added to the questionnaire. The questionnaire was distributed to the customers of public bank X. 40 customers were asked to respond to the questions. The original version of the questionnaire was developed in English. This questionnaire was translated into the local language (Turkish). The local version was retranslated until a panel of experts agreed that the two versions were comparable. Each item was rated on a seven-point Likert scale anchored at the numeral 1 with the verbal statement “Strongly Disagree” and at the numeral 7 with the verbal statement “Strongly Agree”. The questionnaire was pre-tested several times to ensure that the wording, format, and sequencing of questions were appropriate. The questionnaire is given in Appendix B.
- b) Estimation of the parameters:** To estimate the parameters involved, we formulate the following regression equations:

$$\text{Repurchase intention: } \ln R_t^p = \alpha_0 + \alpha_1 \ln P_t + \alpha_2 \ln P_{t-1} + u_t$$

$$\text{Resale intention: } \ln R_t^s = \beta_0 + \beta_1 \ln P_t + \beta_2 \ln P_{t-1} + v_t$$

where  $u_t$  and  $v_t$  are disturbance terms.

**(i) Repurchase intention equation:** In the context of the banking sector under examination, minimum past and present performances appear to induce minimum repurchase intention,

i.e., if  $P_t = 1$  and  $P_{t-1} = 1$ , then  $R_t^p = 1$ , implying that  $\alpha_0 = 0$ .

Since customer behavior in this sector appears to be linked largely to the present performance, we assume, for the sake of simplicity, that  $\alpha_2 = 0$ . Thus, we formulate the following special version of the repurchase-regression equation stated above:

$$\ln R_t^p = \alpha_1 \ln P_t + z_t$$

where  $z_t$  is the disturbance term. The regression-results are as follows:

$$\ln R_t^p = 1.037 \ln P_t \\ (44.399)$$

$R^2 = 0.98$ . t-statistic is given in parentheses. Thus,

$$\alpha_0 = 0 \\ \alpha_1 = 1.037 \\ \alpha_2 = 0.$$

**(ii) Resale intention equation:** To estimate the parameters of the resale intention equation, we asked an official of the bank questions, the answers of which were designed to give the values of the elasticities of resale intention with respect to the present and past performance.

Mathematically, those elasticities are, of course, nothing but  $\beta_1$  and  $\beta_2$  respectively. The answers indicate that a 1% increase in the past performance would increase the resale intention by about 0.1 %, but a 1%

increase in the present performance would increase the resale intention by about 0.9%. Thus,

$$\begin{aligned}\beta_1 &= 0.9 \\ \beta_2 &= 0.1.\end{aligned}$$

To find out the value of  $\beta_0$ , we make use of an approximation stipulating that minimum past and present performances induce a resale intention, which exceeds its minimum value by 5%,

i.e., if  $P_t = 1$  and  $P_{t-1} = 1$ , then  $R^s_t = 1.05$ , implying that  $\beta_0 = \ln 1.05 = 0.048$ .

**(iii) The coefficient of adjustment ( $k$ ):** For simplicity, we will assume that  $P_{t+1} / P_t$  is proportional to the ratio of repurchase intention to resale intention, and hence,  $k = 1$ .

Given the values of the parameters above, we can now determine the value of intertemporal equilibrium performance, which is;

$$\begin{aligned}P^* &= e^{(\alpha_0 - \beta_0) / [(\beta_1 + \beta_2) - (\alpha_1 + \alpha_2)]} \\ &= e^{(0 - 0.048) / [(0.9 + 0.1) - (1.037 + 0)]} \\ &= 3.65.\end{aligned}$$

In view of the performance scale of 1 to 7, an intertemporal equilibrium performance of 3.65 is a mediocre performance. As proven in the appendix, this mediocre performance is also stable over time.

This mediocre service performance has a considerable effect on the service quality. To analyze the performance-quality relationship in a formal manner, suppose that service quality depends on the present performance in the following way:

$$\ln Q_t = \theta_1 \ln P_t + u_t$$

where  $Q_t$  denotes the service quality at time  $t$  and  $u_t$  is the disturbance term. The regression results based on the data available are as follows:

$$\begin{aligned}\ln Q_t &= \ln P_t \\ &(38.011)\end{aligned}$$

$R^2 = 0.98$ . t-statistic is given in parentheses. These regression results imply that  $Q_t = P_t$ .

Given the value of the intertemporal equilibrium performance,  $P^* = 3.65$ , the value of the intertemporal equilibrium quality  $Q^*$  is equal to 3.65, which is mediocre in view of the quality scale of 1 to 7. Thus, the mediocre intertemporal equilibrium performance induced a mediocre intertemporal equilibrium quality in the Turkish public banking sector, indicating a mediocre performance-mediocre quality trap facing the sector across time. Considering the importance of the public banking sector to the Turkish financial system, an inquiry into possible measures or policies that could help avoid such equilibria would be a worthwhile project to undertake. The following section will formulate one possible policy that enables the sector in question to get out of such trapping equilibria.

#### 4. Policy Implications

The analysis in this paper enables us to formulate policies that could help avoid the trap in question. An example of such policies involves productivity increases leading to increases in the performance elasticities of supply. Suppose that, through productivity enhancements, the sum of the performance elasticities of supply increased by 10%, which would lead to an intertemporal value for performance,

$$\begin{aligned} P^* = Q^* &= e^{(\alpha_0 - \beta_0) / [(\beta_1 + \beta_2) - (\alpha_1 + \alpha_2)]} \\ &= e^{(0 - 0.048) / [(1.1) - (1.037 + 0)]} \\ &= 5.91. \end{aligned}$$

Thus, the intertemporal equilibrium performance and quality increased from 3.65 to 5.91. In view of the performance and quality scale of 1 to 7, the new values of intertemporal equilibrium performance and quality are considerably high. Hence a productivity-enhancing policy would move the Turkish public banking sector in question from a mediocre performance-mediocre quality state (equilibrium) to a high performance-high quality state.

There are, however, a number of questions that remain to be answered and that deserve to be thoroughly explored. The questions as to whether mediocre performance-mediocre quality equilibria have anything to do with (the possible absence of) profit motive, whether the profit-motivated

sectors could also run into such equilibria, and whether there are conditions under which such equilibria are altogether escapable are important questions that are worthy of future research. In the concluding section, we will point out a possible framework in which such questions could be answered.

## **5. Concluding Remarks**

The model developed in this paper is a partial equilibrium model concentrating on the public banking sector, and as such it does not take into account the interactions between the public banking sector and other sectors. It is conceivable that the performance and quality levels in the public banking sector may well influence, and be influenced by, other sectors such as the private banking sectors. Moreover, there are other factors, such as government policy, that could affect the sector in question. A comprehensive account all those factors would enrich the analysis of the public banking sector, and could serve as frame of reference for the formulation of policies that could help the sector achieve a variety of objectives. Such a comprehensive analysis could be best undertaken in a general equilibrium framework, which is worthy of future research.

### Appendix<sup>3</sup>

The solution for the second order difference equation,

$$\ln P_{t+1} + (k\beta_1 - k\alpha_1 - 1) \ln P_t + (k\beta_2 - k\alpha_2) \ln P_{t-1} = k(\alpha_0 - \beta_0)$$

has two components, namely a particular solution and a complementary function. We will find these components for  $\ln P_t$  and then take the anti-log of  $\ln P_t$  so as to find the solution for  $P_t$ .

**a) Particular Solution:** Let us try the solution  $\ln P_{t+1} = \ln P_t = \ln P_{t-1} = \ln P^*$ , where  $P^*$  is constant. Substituting this into the second order equation above, we get

$$\ln P^* + (k\beta_1 - k\alpha_1 - 1) \ln P^* + (k\beta_2 - k\alpha_2) \ln P^* = k(\alpha_0 - \beta_0)$$

Solving for  $\ln P^*$ ,

$$\ln P^* = (\alpha_0 - \beta_0) / [(\beta_1 + \beta_2) - (\alpha_1 + \alpha_2)]$$

Thus,

$$P^* = e^{(\alpha_0 - \beta_0) / [(\beta_1 + \beta_2) - (\alpha_1 + \alpha_2)]},$$

which is the intertemporal equilibrium value of performance.

**b) Complementary Function:** To find this component of the solution, we need to consider the following reduced form of the second order difference equation.

$$\ln P_{t+1} + (k\beta_1 - k\alpha_1 - 1) \ln P_t + (k\beta_2 - k\alpha_2) \ln P_{t-1} = 0.$$

A possible general solution could take the form  $\ln P_t = Ay^t$ . Hence,  $\ln P_{t+1} = Ay^{t+1}$  and  $\ln P_{t-1} = Ay^{t-1}$ . Substituting these expressions into the reduced form of the second order equation, we get,

$$Ay^{t+1} + (k\beta_1 - k\alpha_1 - 1) Ay^t + (k\beta_2 - k\alpha_2) Ay^{t-1} = 0.$$

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<sup>3</sup> For a variety of exercises similar to this one, see Kara (2003), and Chiang (1988).

Canceling the common factor  $Ay^{t-1} \neq 0$ ,

$$y^2 + (k\beta_1 - k\alpha_1 - 1)y + (k\beta_2 - k\alpha_2) = 0.$$

This quadratic equation could have at most two roots. Substituting  $\alpha_1 = 1.037$ ,  $\alpha_2 = 0$ ,  $\beta_1 = 0.9$ ,  $\beta_2 = 0.1$  into the quadratic equation and solving it for the roots, we get,

$$y_1 = 0.940$$

and

$$y_2 = 0.106.$$

Thus, the solution for the reduced equation is

$$A_1y_1^t + A_2y_2^t = A_1(0.940)^t + A_2(0.106)^t$$

where  $A_1$  and  $A_2$  are non-zero constants.

**c) The general solution:** The general solution for the equation is the sum of the two solutions obtained in (a) and (b),

$$\begin{aligned} \ln P_t &= A_1y_1^t + A_2y_2^t + (\alpha_0 - \beta_0) / [(\beta_1 + \beta_2) - (\alpha_1 + \alpha_2)]. \\ &= A_1(0.940)^t + A_2(0.106)^t + 0.048 / 0.037. \end{aligned}$$

Hence,

$$P_t = \exp(A_1(0.940)^t + A_2(0.106)^t + 0.048 / 0.037)$$

The values of  $A_1$  and  $A_2$  could be obtained by specifying two initial conditions. However, for the purposes of our analysis, we do not need to know the values of those constants.

Since the absolute values of  $y_1 = 0.940$  and  $y_2 = 0.106$  are less than 1, as  $t \rightarrow \infty$ ,  $A_1y_1^t + A_2y_2^t$  will converge toward zero, and hence the general solution converges toward the particular solution,

$$\begin{aligned} P^* &= e^{(\alpha_0 - \beta_0) / [(\beta_1 + \beta_2) - (\alpha_1 + \alpha_2)]}, \\ &= e^{0.048/0.037} \\ &= 3.65, \end{aligned}$$

which is nothing but the intertemporal equilibrium performance. Thus the system designed by the model has a dynamically stable intertemporal equilibrium.

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