Central Bank Review
Vol. 12 (January 2012), pp.1-12
ISSN 1303-0701 print / 1305-8800 online

http://www.tcmb.gov.tr/research/review/

REGULATING CHECK USE IN TURKEY

Semih Tümen*

ABSTRACT This paper develops a simple model of the market for checks in Turkey. The Central Bank controls the lump-sum amount that the drawee banks are legally responsible to pay per bad check. An increase in this amount is believed to support real economy. I show that banks will tend to restrict the quantity of checks when this responsibility is increased. A percentage point increase in banks' obligation per bad check could lead up to a 1.7% decline in the total supply of checks on the margin. This means that a rise in this obligation may harm the real economy rather than providing support.
JEL D42, E42, G21, G28
Keywords Checks, Regulation, Monopoly, Heterogeneous preferences

ÖZ Bu çalışma Türkiye'deki çek piyasasını basit bir teorik çerçevede incelemektedir. Merkez Bankası çek defterini sağlayan bankaya düşen nakdi sorumluluk tutarını belirlemektedir. Bu tutarın artırılmasının reel ekonomiyi destekleyebileceği düşüncesi hakimdir. Bu çalışma, söz konusu tutardaki artışın bankaların çek arzını kısacağını göstermektedir. Sorumluluk tutarındaki %1'lik bir artışın çek arzı üzerinde %1.7'ye varan azalmalara yol açabileceği ve bu düzenlemeden en fazla etkileneceklerin küçük ve orta ölçekli işletmeler olacağı tahmin edilmektedir. Bu da, söz konusu artışın reel ekonomiyi desteklemekten ziyade zarar verebileceğine işaret etmektedir.
TÜRKİYE'DE ÇEK KULLANIMININ DÜZENLENMESİ
JEL D42, E42, G21, G28
Anahtar Kelimeler Çek piyasası, Düzenlemeler, Tekelci firma, Heterojen tercihler

* Central Bank of the Republic of Turkey, Statistics Department, İstiklal Cad.10, 06100-Ankara, Turkey ▪ **TÜMEN:** semih.tumen@tcmb.gov.tr ▪ This paper is a shortened version of the author's original paper "Regulation and the Market for Checks" (Economic Modelling 29(3):858-867) ▪ All the views expressed in the paper belong to the author and do not represent those of the Central Bank of the Republic of Turkey, or its staff.

1. Introduction

Commercial life in the Turkish economy extensively draws on checks as a medium of exchange. Unlike the US economy and other modern economies, where checks are used in all kinds of daily transactions, checks are almost exclusively used by merchants in the Turkish economy. This fact highlights the importance of regulatory practices and policy actions associated with the use of checks for the real economy, and, in particular, for small- and medium-scale enterprises which are substantially dependent on checks to ease out their liquidity needs.

Banks issue checks against some form of collateral. The nature and the amount of the collateral demanded largely vary across banks. Merchants use these checks in their transactions and the owner of the check has the right to cash out. Most of the time two parties informally agree on a future cash out date – typically up to 12 months – for a current transaction. The party who accepts the check bears the risk of not getting paid. When the economic outlook is positive, this is less of a concern. During downturns, however, sensitivity in risk perceptions increases and merchants become more careful in accepting checks. Checks are so widely used that seeking cash-only transactions would mean to lose an important fraction of customers. Moreover, checks are attractive for all parties since they offer a flexible borrowing instrument the terms of which are decided bilaterally. Perhaps the most striking feature of checks is that they can be signed off to third parties for further circulation. There is no close substitute for checks offering similar benefits. But still, checks impose an exogenous risk on enterprises and this risk frequently leads to a debate over government regulation.

In addition to the standard legal framework regulating check use, there is a simple rule that the Central Bank of Turkey sets on behalf of the Turkish government: drawee banks are obliged to pay a certain lump-sum amount – that I call π – to the check owners per bad check. In other words, the government decides on the extent of the *risk-sharing* between the check owner and the drawee bank. Table 1 shows the historical values for drawee banks' obligation, π, in both real and nominal terms.[1] These obligations impose a non-negligible burden on the Turkish banking system. Each year

[1] Notice that Table 1 does not consider what happens to π after 2009. The reason is that, in 2010, sentence of imprisonment for writing bad checks is removed, which leads to changes in behavioral motives, a complexity that I do not want to deal with in this paper.

these payments amount to a roughly 0.5% of the equity capital of the whole banking sector.[2]

Table 1. Drawee Banks' Obligations Per Bad Check*

Year	π (TRY)	Real π (1995 = 100)
1985	0.02	216
1990	0.125	158
1993	0.5	135
1995	1.5	100
1997	5	110
2002	60	105
2003	300	416
2004	310	368
2005	350	389
2006	370	372
2007	410	375
2008	435	368
2009	470	363

*Real π is calculated using the CPI series.

The main motivation behind this paper is a recurring policy debate: from time to time, the Turkish government considers proposing a substantial increase in π. The aim is to partly transfer the check owners' risk to drawee banks and, further, to establish a government control – as a policy tool – over the risk-sharing arrangements in the market for checks. The proposal seems innocuous in the sense that it is expected to serve as a partial insurance for the check owners and to provide a longer run stimulus for the banks to perform more efficient screening practices. However, screening is costly and requires a continuous investment in institutional (external and internal) auditing, from which the banks avoid. As a reaction to such an increase in π, banks will tend to exercise their monopoly power and restrict the number of checks they issue. This restriction is likely to operate through various channels and may result in non-negligible effects on the level of economic activity. One channel worth mentioning is the amount of collateral demanded by the drawee banks. By increasing collaterals, banks can impute the risk to the checkbook owners. Thus, only the best customers and the ones who agree to pay the increased collateral will own a checkbook.

From a macroeconomic stand point, this discussion relates to the supply of the so-called "inside money", i.e. the debt used as money. Net inside money should always add up to zero in an economy, but inside money is

[2] It is worth mentioning that not every bad check goes through this process. Sometimes the bad check owners do not want to start legal proceedings since they would like to preserve their existing commercial links with their clients.

measured in gross terms, i.e., by the amount of liability to the issuer (the person who writes the check in our context). Checks make up a significant fraction of inside money in the Turkish economy. The fact that checks circulate brings in a large multiplier effect. If banks restrict the supply of checks as a reaction to an increase in π, the volume of gross inside money in the economy would shrink and, in turn, the economic activity relying on checks (which is vast in Turkey) would likely slow down. Kiyotaki and Moore (2000) establish conditions under which the circulation of inside money is essential for the smooth running of the economy and define the "symptoms" of liquidity shortage. In a related work, Kocherlakota (1998) points out the commitment issues resulting from bilateral agreements. See Lagos (2008) for an excellent review of the related literature.

The literature on checks and related payment systems issues is vast. However, a surprisingly small number of attempts have been made to incorporate checks into standard economic models. One example is He et al (2005) – a version of Kiyotaki and Wright (1993) – which is a model of equilibrium search. Another is McAndrews and Roberds (1999). Most of these papers take either a monetary economics or a methodological payments systems approach. This paper differs from the others in that it brings in the law and economics components of the problem via analyzing the effects of altering the regulatory practices on equilibrium outcomes in the market for checks.

In this paper, I abstract from the theoretical issues that monetary economics deals with and, instead, I focus on a simple monopoly problem. Since banks are the sole suppliers of checkbooks and they have the ability to adjust the quantity of checks as a response to changing market conditions, I treat the banking sector as a single bank, the monopolist.[3] The monopolist "sells" checks at the monopoly "price" and bears the total cost of producing checks: π times the number of bad checks that the monopolist makes payment for. Price of a check that I study in this paper is an abstract notion. I call it the "implicit" price. Loosely speaking, price of a check can be thought of as a composite of various pecuniary and non-pecuniary factors such as the opportunity cost of the collateral demanded by the drawee banks or the benefits and flexibilities that checks offer.

In discussing the policy effects, I concentrate on a key parameter that naturally arises from our analysis: the π-elasticity of demand for checks, ε_π. In other words, I derive an explicit formula displaying the percentage change in the quantity of checks resulting from a percentage change in π. To

[3] It sounds more reasonable to assume imperfect competition with many banks, but the returns from such a setup do not worth the cost of algebraic complexity that would arise. Moreover, the monopoly problem yields, as I discuss in the rest of the paper, easier-to-interpret and sharper results.

pursue this goal, I assume a simple model of preference heterogeneity for checks that would generate a distribution of individuals along the demand curve. I show that the effect of an increase in π on check use depends on three main factors: the elasticity of demand for checks, the curvature of bad checks as a function of the total supply of checks, and the degree of heterogeneity in the willingness to pay along the demand curve. I calibrate the model using the available data and show that the π-elasticity of demand for checks, ε_{π}, equals -1.70 on the margin. The original idea behind such a policy is to support the real economy by increasing the credibility of checks. The credibility of checks would indeed increase but, unfortunately, the prospects for the real economy would not be as good as expected. I argue that drawee banks will tend to limit the burden that falls on themselves by restricting the supply of checks. This would hit the check-dependent sectors, especially the small enterprises which are less competitive in accessing liquidity.

The plan of the paper is as follows. Section 2 presents the monopoly model with heterogeneous agents. Section 3 provides the details of data, calibration, and the results of the paper. Section 4 concludes.

2. The Model

I model the individual demand for checks by distinguishing the extensive and intensive margins.[4] The characteristics of the market for checks allow us to make such a simplification. In other words, one can think of the market for checks in such a way that individuals are either able to get checks, $Q_j = 1$, or not, $Q_j = 0$. Figure 1 sketches the decision making rationale for each individual j, $j = 1, \ldots, N$, where N is the relevant population. It can be interpreted as the individual demand curve. If the monopoly price is above υ_j, the individual j will not buy checks, and will buy checks if it is below υ_j.

I assume a continuous and twice differentiable cumulative distribution function, $F_{\upsilon}(p)$, of υ_j in the population, where υ denotes a nonnegative random variable representing individual tastes and p is a realization of υ. The shape of the market demand for checks depends on the population distribution of individual preferences. $1 - F_{\upsilon}(p) = P[\upsilon_j \geq p]$ is the probability of individual j's valuation being strictly greater than or equal to some certain willingness to pay level p. Thus, the number of individuals with values at least equal to p can be written as

$$Q(p) = N[1 - F_{\upsilon}(p)] \tag{1}$$

This is the market demand for checks. In this aggregate formulation, I

[4] The model that I present in this section is a version of the model developed in Tumen (2012), in which I extend the basic model in several directions and I analyze various aspects of the market for checks in Turkey.

account for the switching composition of who buys and who does not rather than individual substitution. Differentiating Equation 1 with respect to p yields

$$Q'(p) = -Nf_{v}(p) \tag{2}$$

where $\frac{\partial F_{v}(p)}{\partial p} = f_{v}(p)$ is the probability density of individual values. Completing to elasticities, I get

$$\varepsilon(p) = -p\frac{f_{v}(p)}{1-F_{v}(p)} \tag{3}$$

which is a familiar expression. The term $\frac{f_{v}(p)}{1-F_{v}(p)}$ is a hazard rate. It is the hazard of being on the margin and it measures how many individuals there are on the margin relative to how many are currently buying checks. The demand will be very elastic when there are a lot of individuals on the margin relative to the number of infra-marginal individuals. Given p, if there are a lot of people with very similar tastes and if price tends to be close to that level, one gets a very elastic response. As a result, the shape of the market demand curve for checks largely depends on the functional form of F_{v}.

For concreteness, I assume that the distribution of tastes is exponential. In other words, I assume

$$F_{v}(p) = P\left[v_{j} \leq p\right] = 1 - e^{-\lambda p} \tag{4}$$

where $\lambda > 0$ is the rate parameter governing the spread of the exponential distribution. This assumption greatly simplifies the analysis since it produces a constant hazard rate which is a well-known property of the exponential distribution. More precisely, it produces

$$\frac{f_{v}(p)}{1-F_{v}(p)} = \lambda \tag{5}$$

This directly implies that $\varepsilon(p) = -p\lambda$. In other words, **(i)** the law of demand holds, **(ii)** the elasticity of demand is parameterized by λ, the rate parameter of the exponential distribution, and **(iii)** the elasticity changes along the demand curve since it is a function of p. As λ increases, the tail of the distribution becomes thinner.

To characterize the properties of the equilibrium outcome, I rewrite the monopoly problem by letting the monopolist choose the price in the following way:

$$\max_{p}\left[pQ(p) - \pi\gamma b\big(Q(p)\big)\right] \tag{6}$$

where $\pi > 0$ is the lump-sum monetary cost that the bank has to incur per bad check, $b\big(Q(p)\big)$ is the number of bad checks as a function of the scale, $Q(p)$, and $0 < \gamma < 1$ is a parameter representing the fraction of bad checks that the drawee banks pay π. I assume throughout that $Q(\cdot)$ and $b(\cdot)$ are continuous, twice differentiable for all $p \geq 0$ and that $b'(\cdot) > 0$. The first-order condition is

$$Q(p_m) + p_m Q'(p_m) = \pi\gamma Q'(p_m) b'(Q(p_m)) \quad (7)$$

where p_m is the monopoly price. After trivial algebra, I get

$$p_m \left[1 + \frac{1}{\varepsilon(p_m)}\right] = \pi\gamma b'(Q(p_m)) \quad (8)$$

Note that I restrict $\varepsilon(p)$ being less than -1 to ensure that the monopolist operates, i.e., $MR \geq MC$.[5] The second-order condition is

$$p_m Q''(p_m) + 2Q'(p_m) < \pi\gamma\left[Q''(p_m) b'(Q(p_m)) + Q'(p_m)^2 b''(Q(p_m))\right] \quad (9)$$

Plugging Equations 1 and 2 into 8 and 9, using the assumption of exponentially distributed tastes, and assuming $b(Q(p)) = \alpha Q(p)^\beta$, with $\beta > 0$, I obtain

$$p_m - \frac{1}{\lambda} = \pi\gamma\alpha\beta N^{\beta-1}\left(e^{\lambda p_m(1-\beta)}\right) \quad (10)$$

The monopoly price, p_m, is determined as a fixed point in Equation 10. Note that the cost curvature parameter β describes how fast the share of bad checks rises in the total supply of checks as the quantity increases. The cost function is convex if $\beta > 1$ and concave otherwise. The optimal quantity is determined using the demand relationship

$$Q(p_m) = Ne^{-\lambda p_m} \quad (11)$$

Proposition 1. The monopoly price, p_m, is a decreasing function of λ, if $\beta > 1$.

Proof: I differentiate both sides of Equation 10 by p_m and λ which yields

$$dp_m + \frac{1}{\lambda^2} d\lambda = p_m(1-\beta)\left(p_m - \frac{1}{\lambda}\right) d\lambda + \lambda(1-\beta)\left(p_m - \frac{1}{\lambda}\right) dp_m \quad (12)$$

Regrouping the terms and using the elasticity formula, $\varepsilon(p_m) = -\lambda p_m$, I obtain

$$\frac{dp_m}{d\lambda} = \frac{\frac{1}{\lambda^2}[\varepsilon(p_m)(1-\beta)(\varepsilon(p_m)+1) - 1]}{1 + (1-\beta)(\varepsilon(p_m)+1)} \quad (13)$$

The denominator is positive and the numerator is negative since $\varepsilon(p_m) < -1$ and $\beta > 1$. Hence, it follows that $\frac{dp_m}{d\lambda} < 0$, as required.

In words, as tastes become more dispersed, the monopolist charges a lower price if the cost function is convex.[6] The intuition is the following: when there are more people on the margin relative to the people who currently have checks, the monopolist charges a lower price to induce more people to come in. A higher λ means that the people with high willingness to pay are represented by a lower fraction in the population. The upper tail becomes less elastic and the lower tail becomes more elastic. Then the most

[5] As the competitiveness conditions improve, $\varepsilon(p)$ goes to $-\infty$, which implies that the equilibrium condition approaches to $P = MC$. Thus, the array of industry structure that the model captures is wide, ranging from monopoly to perfect competition. See Tumen (2012) for a detailed discussion of the link between industry structure and the policy effectiveness.

[6] I verify this convexity in Section 3.

important question is: where does the monopolist operate? This depends on the magnitude of λ. I answer this question in Section 3, where I calibrate the model. The answer to this question is of extreme importance for the analysis since it determines how widespread would the effect of an increase in π be.

The parameter of interest ε_π, the π-elasticity of check use, measures the percentage change in check use as π goes up by one percent. The next proposition defines the properties of this parameter.

Proposition 2. If the demand for checks is of the binary structure and if preferences are exponentially distributed, then

a. our policy parameter ε_π is

$\varepsilon_\pi(p_m) = \frac{\varepsilon(p_m)+1}{1-(\beta-1)(\varepsilon(p_m)+1)}$; and

b. it must be the case that $(\varepsilon(p_m)+1)(\beta-1) < 1$.

Proof: I totally differentiate Equation 11 and get

$$dQ_m = -\lambda N e^{-\lambda p_m} dp_m \Rightarrow dp_m = -\frac{1}{\lambda}\frac{dQ_m}{Q_m} \tag{14}$$

Differentiating Equation 10 with respect to p_m and π, I obtain

$$dp_m = \left(p_m - \frac{1}{\lambda}\right)\frac{1}{\pi}d\pi - \lambda(\beta-1)\left(p_m - \frac{1}{\lambda}\right)dp_m \tag{15}$$

which implies, after completing to elasticities, that

$$\big(1-(\beta-1)(\varepsilon(p_m)+1)\big)dp_m = -\frac{1}{\lambda}(\varepsilon(p_m)+1)\frac{d\pi}{\pi} \tag{16}$$

I, then, plug the expression 14 in 16 to get the required result. This completes part **a**. For part **b**, I start with plugging the demand equation into the second order condition 9. Then the result is immediate.

In the next section, I use the available data to calibrate the model. I present the main predictions of the binary demand structure.

3. Data, Calibration, and Numerical Results

The available data on checks has been collected by the Central Bank of the Republic of Turkey and cover the period 2000-2009 on a monthly basis. I have access to data on the total number of checks issued, Q, and the number of bad checks, $b(Q)$, as well as the aggregate face values of these two variables. The data is aggregated across banks and individual effects are not detectable.

Figure 2 plots Q against $b(Q)$. Obviously, $b(Q)$ is *increasing* in Q. But whether it is linear, convex, or concave in Q is not obvious. This relates to the cost curvature parameter, β. So the question is the following: what is the magnitude of β?

The customer screening procedures of drawee banks are not explicitly modeled in this paper. Nevertheless, it is not hard to conjecture that $\beta > 1$.

Since banks supply checks to the safest customers first, one would naturally think that the share of bad checks would rise in an increasing fashion as the bank spreads out checkbooks to new customers. In other words, the selection process of the drawee banks would govern the parameter β. A second factor could be the state of the economy. During recessions, one would expect to have a higher β than in booms.

In estimating β, a microeconomic setup with a focus on screening and filtering of customers by banks would be a natural starting point. However, such an approach will be seriously bounded by the lack of micro data. Given that I only have data on the total supply of checks and the total quantity of bad checks, the number of methods that one could use to estimate β is limited. To have a rough idea on the magnitude of β, I run the following naive regression:

$$\log(b_t) = \log(\alpha) + \beta \log(Q_t) + \eta_t \tag{17}$$

which is based on the presumed relationship $b(Q) = \alpha Q^\beta$. Table 2 summarizes the estimates of this simple least squares regression. These estimates lead us to choose $\beta = 1.3$ and $\alpha = e^{-6.8} \approx 0.0011$.[7] The goal, for the rest of this section, is to calibrate the model parameters γ, π, λ, and N, and then analyze the response of Q_m to an increase in π. I then interpret the results and evaluate policy implications.

Table 2. Regression Results*

Parameter	Estimate	St. Error
$\log\alpha$	-6.8	1.91
β	1.28	0.13

*Results from regressing the log of b on the log of Q. The number of observations is 107. The data is monthly and covers the period 2000-2009. I ignore 9 data points which are reported to contain incomplete information. R^2=0.46, F-statistic = 94.7.

Table 3 summarizes the calibration. I calibrate γ using the balance in the relevant account in the banks. I divide that number by π and find the total number of checks that the banks paid π. Then, I divide this number to the total number of bad checks to obtain $\gamma = 0.24$. The task of calibrating λ is more subtle. I use the following guess-and-verify algorithm to jointly determine λ and p_m.

[7] I estimated versions of this regression equation incorporating variables representing the macroeconomic performance of the economy. I tried GDP growth rate and the growth rate of industrial production along other variables. I found higher estimates for β ranging between 1.6 and 2.1 (with slightly lower significance levels). However, one has to be cautious about these alternative estimates because of two reasons: **(i)** the total number of checks and the macroeconomic state are possibly correlated and **(ii)** the model does not incorporate macroeconomics.

Table 3. Calibration

Parameter	Value	Matched to Fit
α	0.0011	Regression outcomes
β	1.30	Regression outcomes
γ	0.24	Balance in the check accounts
N	$7.5\ million \times 25$	Number of commercial bank accounts
π	TRY 470	Current level of the policy tool
λ	0.27	Average $Q = 2.2\ million$

Algorithm 1. Calibrating λ.

1. Calculate $\bar{Q}$, the average Q.
2. Set an initial level of λ and calculate p_m using Equation 10.
3. Calculate Q_m in Equation 11.
4. If $Q_m = \bar{Q}$, stop. If $Q_m > \bar{Q}$ ($Q_m < \bar{Q}$), decrease (increase) λ and compute a new p_m. Iterate over Step 3, until Q_m converges to $\bar{Q}$.

Notice that, in Step 4, I use the statement in **Proposition 2** to determine the direction of convergence. Alternatively, one could use an appropriately formulated Riccati equation to compute an iterative solution to the limiting outcome. In calibrating λ, the most important point is the definition of Q. I have access to data on the number of checks in circulation and the number of bad checks. I do not have information on how many people have access to checks. Normally, when an agent is entitled to use checks, he can own a checkbook with (on average) 25 checks. But, there is no way I can filter the data to make such an adjustment. Instead, I reinterpret the model as a model of willingness to pay *per check* rather than the number of individuals. To determine the size of the relevant population, N, I need to account for both the intensive margin and the extensive margin in the market for checks. I use the publically available BRSA (Banking Regulation and Supervision Agency) data on the number of commercial bank accounts. These are actual and potential checkbook owners. I set $N = (7.5\ million) \times 25$, which is the number of commercial bank accounts (as of the beginning of 2009) times the average number of checks per checkbook. One needs to make this adjustment because the data I have is in terms of the number of checks. After running the algorithm, I find $\lambda = 0.27$.

Table 4. Predictions of the Model

Parameter	Predicted by the model
ε_π	-1.70
ε	-4.47
p_m	TRY 16.53
Q_m	Average $Q = 2.2\ million$

Table 4 summarizes the main results. Since the rate parameter (λ) is low, the dispersion of tastes is large, i.e., the preference distribution has a fat right tail. This means that the mass of individuals with high willingness to pay is large. This induces a higher price, since, by **Proposition 1**, the monopoly price is a decreasing function of λ.

The model yields the result that the elasticity of demand for checks is -4.47 on the margin. As **Proposition 2** states, the more elastic the demand for checks is, the higher is the policy response. The model predicts a 1.7% decrease in the total supply of checks as a response to 1% increase in π. These results imply that the margin that the monopolist operates is subject to a very elastic response. This is probably because the firms on the margin are mostly small- and medium-scale enterprises with low willingness to pay. Since λ is low, the hazard of being on the margin, in other words, the number of people on the margin relative to the number of agents with checkbooks, is low. But a low λ induces a high monopoly price which puts a further downward pressure on the demand for checks making the response elastic.

4. Concluding Remarks

This paper formally discusses the potential effects of a proposed policy action in Turkey: an increase in π, the amount that drawee banks are legally obliged to pay per bad check. This is believed to support the real economy by increasing the credibility of checks. During economic downturns, particularly small-scale enterprises complain that they are having difficulties in getting full payment for their checks when they demand a cash-out. The economic analysis of what could happen in response to an abrupt increase in π suggests that drawee banks would cut the supply of checks which, in turn, would hit the real economy. The policy target is to ease the risk of liquidity shortages that the small firms are exposed to. On the contrary, the model presented in this paper predicts that an increase in π would first hit small-scale enterprises.

I argue that the magnitude of the effect of an increase in π on the total supply of checks depends on the elasticity of demand for checks, how fast the fraction of bad checks increase with the total quantity of checks, and how heterogeneous the tastes are. I show that the policy response on the margin is fairly elastic. Although the accuracy of these results is questionable since the data lack micro-level depth, the workings of the mechanism I demonstrate are sensible. Understanding this mechanism will be of great importance especially when π is used a policy instrument. How the macroeconomic performance interacts with the market for checks is a relevant question and I leave answering that question for future research.

Figure 1. The Demand Curve for Individual

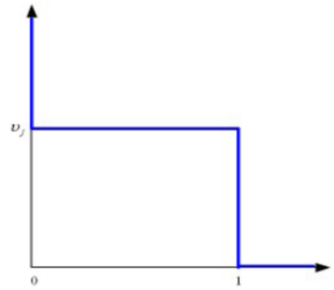
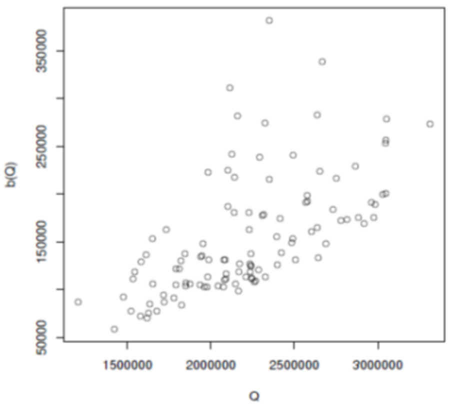


Figure 2. The Number of Bad Checks Versus the Total Quantity of Checks



References

He, P., L. Huang, and R. Wright, 2005, "Money and Banking in Search Equilibrium" *International Economic Review* 46, 637–670.

Kiyotaki, N. and J. Moore, 2000, "Inside Money and Liquidity" unpublished manuscript, University of Edinburgh.

Kiyotaki, N. and R. Wright, 1993, " A Search-theoretic Approach to Monetary Economics" *American Economic Review* 83, 63–77.

Kocherlakota, N., 1998, " Money is Memory" *Journal of Economic Theory* 81, 232–251.

Lagos, R., 2008, " Inside and Outside Money" in M. Bils and L. Ohanian (Eds.), *The New Palgrave Dictionary of Economics*. Palgrave Macmillan.

McAndrews, J. J. and W. Roberds, 1999, " A General Equilibrium Analysis of Check Float" *Journal of Financial Intermediation* 8, 353–377.

Tumen, S., 2012, "Regulation and the Market for Checks" *Economic Modelling*, forthcoming.