The Relationship Between Consumer Confidence Index and Online Credit Card Using in Turkey: New Evidence From Frequency Domain Causality Test

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Abstract
Monthly data for the period between January 2008 and December 2012 were examined in this study which investigated the relationship between consumer confidence index (CCI) and online credit card using (CCU). The variables were found to have an integrated structure after testing of the collected data with Hatemi-J cointegration test (2008) which enables two-structural break. It has been observed that the results are inconsistent when the relationship between these two variables examined with Toda Yamamoto (1995) and Hacker Hatemi-J (2006) causality tests. Therefore, frequency domain causality test has been used and the conclusion reached that a one-way and temporary relationship from consumer confidence index to online credit card using. It’s seen that the existence of this relationship supports the studies in the literature.
ONLINE SHOPPING AND RISK PERCEPTION

Development of Internet and information technologies changed the structure of sales channels day after day. This new economic system which can be described as e-commerce, online shopping, virtual market and so on provided great conveniences to manufacturers and retailers in terms of reaching to consumers (Chang and Chen, 2008; Lee et al., 2010; Harris and Goode, 2010). Thereby the physical markets where the exchanges occur with the manufacturers and consumers have been turned into virtual markets. This paved the way for the rise of online shopping. Shopping made through Internet is not an instant decision-making activity; conversely is a process which includes different activities inside. Consumers prefer to shop on the Internet for reasons such as ease of information access, unlimited choice, low price, speed and customization etc. (Liu and Forsythe, 2010; Demirel, 2010; Mokhtarian, 2004). In this context, it can be easily expressed that online shopping facilitates consumers' lives in today's hectic working tempo.

However, there are also some risks as well as these conveniences of online shopping. Information asymmetry and unobservability can be shown as the main reason of risk in online shopping (Tan and Thoen, 2010; Liu and Wei, 2003). Information asymmetry refers to the uncertainties arising from different types of information parties have (Sandmo, 1999). Consumers can not know exactly the quality of product/service whether demonstrated on the Internet because of the information asymmetry; on the contrary the seller has full information. In other words, the consumer thinks that the seller would benefit from this process in an opportunistic way. In addition, consumers can not evaluate the quality of product directly due to the unobservability (Wan et al., 2012). Consumers do not have the ability of experiences such as try, taste, touch and smell as virtually in online shopping. This can be shown as another factor increases the risk perception.

Perceived risk creates an effect which reduces the willingness of consumers’ online shopping behavior and product purchases (Masoud, 2013; Kim and Lennon, 2013). It can be stated that, perceived risk is a more critical factor when its components analyzed in terms of online shopping. Consumers' lack of opportunity to evaluate products directly reveals the product risk. Consumers must rely on the product information on the screen (Jarvenpaa et al., 2000). However, the product may differ from the expected one or expected benefits cannot be obtained even if the desired product delivered. Time risk refers to waste time during the information search about the product or service (Forsythe et al., 2006). It occurs when the time spent is not to be worth the candle. It can be also said that the reason for social risk is the factor of intangibility. The product obtained after the delivery cannot be appreciated by family members, close friends or social group. Financial risk will be addressed in the following sections.

The reasons of risk in online shopping can be listed as below (Zhou et al., 2008);
• Products cannot physically tested
• Payment and delivery of products takes place at different times
• Lack of knowledge about the system procedure
• Lack of face to face communication
• Intangibility resulting from the nature of the virtual environment
• Security issues

TRUST AND CONSUMER CONFIDENCE INDEX

Trust is a very important concept that regulates social relationships between people and reduces uncertainty of human behavior in some cases (Li et al., 2011). Trust is the belief that the other party behaves in a reliable, ethical and socially appropriate way, and will fulfill the commitment (Gefen, et al., 2003). Trust increases when expectations of the other party are consistently and reliably met, and decreases when the other party acts otherwise (Weisberg et al., 2011). In other words, it can be said that trust is shaped by the attitudes of the individual towards the other party.

Trust becomes more and more critical from the perspective of online shopping. Because, trust provides the continuity and completion of online transactions in case of uncertainty (Wu and Cheng, 2005; Flavian and Guinaliu, 2006). Trust in online shopping, can be towards e-retailer as well as computer or the system itself. In this context, it can be expressed that factors such as perceived reputation of the organization, comments of the previous customers, security software etc. influence trust in online shopping (Li et al., 2007).

Trust, is located in the center of many electronic transactions. Trust is a sine qua non concept in electronic commerce. The main three reasons as follows (Furnell and Karweni, 1999);

• First one is the reason due to lack information about the counterparty. It may be beneficial the presence of a third party that known by both parties in order to resolve the lack of this information.
• Second reason is the control deficiency of the transfer process of goods or services from seller to buyer. A control system can be created to secure all the stages of this transfer process.
• The last reason arises from the different rules and procedures about the parties they locate. This issue can be resolved with the help of the international law.

Consumer confidence index is an economic indicator that reflects consumers’ opinions about their current status and future expectations (Özsağır, 2007). A person's or household's financial condition, the general economic condition in the country and people tendency to save money and expenditure are used to calculate the consumer confidence index (TCMB, 2014). Consumer confidence index has a critical importance. Because it reflects information relating to consumer attitudes in case of purchasing capacity as well as willingness to purchase (Çelik et al., 2010).

Consumer confidence index is very important due to make consumer confidence measureable. Because intangibility caused by the nature of online shopping can be overcome with increased levels of consumer confidence. In this context, it can be said that consumers' attitudes towards types of expenditure, the expenditure and payment tool, e-retailer and online systems, and continuity of purchase intention are closely associated with the consumer confidence index. The increasing of consumer trust and also consumer confidence index will also enhance the ability to resist to uncertainties that may occur in the future.
TRUST AND CREDIT CARD

Internet and information technologies change the structure of markets as well as payment systems. Consumers now can make their payments without any physical money in online shopping (Yıldırım, 2012). Electronic payment systems include 4 components in general which are customer, seller, bank, and a trusted third party (Chan and Chang, 2006; Wang et al., 2005). This trusted third party has been added by the parties to the payment protocol in order to ensure the online transactions. It’s used as a defense tool against any disputes may occur (Lin and Liu, 2009). In other words it allows continuing of electronic transactions without interruption by creating a confidence atmosphere. Electronic payment systems are preferred by consumers due to the advantages such as convenience and speed (Wang et al., 2009).

Consumers can use the electronic payment systems such as credit card, bank transfer, digital wallet, mail order and etc. in online shopping (Mangiaracina and Perego, 2009). Credit card is more preferred by consumers in online shopping due to ease of use, opportunity to purchase on installments and internationally recognized. Consumers who shop on the internet start the payment process by entering credit card information to the relevant fields. Then, accuracy of the credit card information is investigated by the seller. After the verification, the amount of the product is charged and payment process is completed if the credit card account is appropriate for payout (Elibol and Kesici, 2004).

However, there may be malicious people in the system and this risk cannot be observed by the actors in the payment process (DelVecchio et al., 2002). Therefore, customers refrain from giving personal information such as credit card in virtual environments. Because they don’t have the chance to evaluate the product directly and they concern about the privacy of financial information (Lee and Turban, 2001). According to a study made by MasterIndex (2011) in Turkey, the conclusion has been reached that the most important factor is a “trusted bank” with the largest percentage of 27% in credit card choice. The same study also shows us the most important reasons not to shop online. The former is mistrust towards giving personal information (credit card and private information) and the latter is mistrust towards the quality of the product. These two reasons have a ratio of % 63 overall. This lack of trust creates the financial risk through online credit card using. Financial risk can be described as the money paid is not to be worth for the product or meeting a loss due to lack of security (Maignan and Lukas, 1997).

It’s undoubtedly the trust feeling which reduces the uncertainty and makes credit cards more utilizable in online transactions. Online trust includes security, privacy and reliability inside (Ling et al., 2010). In this context, credit card information can be sent in secure with the SSL/TLS system in online environments when considered the systems that increase trust and security (Al-Dala’in et al., 2008). This system is used in order to protect information during the process of online transactions (Vorapranee and Chris, 2002). Another similar system which is Secure Electronic Transaction (SET) developed by Visa and MasterCard is used to ensure information security and confirm the accuracy of retailer, customer and bank (Özbay and Akyazı, 2004).

BACKGROUND AND RELATED WORKS

A literature review has been conducted in order to investigate previous studies; nevertheless no study related to consumer confidence index and credit card using could be found. Hence, consumer confidence index has been considered as a sub-
component of trust concept. In this context, studies which are about online credit card using and trust have been analyzed. It's expressed that mistrust arising from the lack of face to face interaction in the online environment affects credit card using and people prefer to rely on people instead of systems (Friedman et al., 2000). In similar studies it's emphasized that trust and social trust is highly effective in developing positive attitudes and enhancing the willingness towards online credit card using, and increasing online credit card payments (Ratnasingham, 1998; Gefen, 2000; Tan and Thoen, 2002; Dahlberg et al., 2003).

In other studies it has been concluded that trust will occur for credit card using if the possibility of a loss guaranteed by an amenable party. In other words, the level of online trust increases when the responsibility is assumed by the credit card company or the trusted third party (Chu et al., 1997; Schneiderman, 2000; Al-Dalain et al., 2008). In addition, Shu and Cheng (2012) have found the messages that provide the reliability of the source are effective in the development of positive attitudes toward online credit card using. Furthermore, Manchala (1998) has indicated that trust increases in the area of lower cost and high quality of transactions, and this trust affect credit card using positively.

When previous studies analyzed in terms of system, it has been concluded that making computer systems and applications more secure will enhance the trust towards credit cards and other online transactions. It can be said that, systems such as 3D Secure, digital wallets and etc. decrease the concerns of consumers about sharing credit card information in online shopping (Viega et al., 2001; Kim and Benbasat, 2003; Mangiaracina and Perego, 2009). Likewise, hiding credit card information to parties, chancing and encryption of credit card numbers in every new online transaction affect online trust, correspondingly credit card using (Chelappa and Pavlou, 2002; Hwang et al., 2003; Buccafurri and Lax, 2011).

In this study, we used cointegration and causality tests in order to impart a new perspective via data associated with consumer confidence index and online credit card usage. In this context, the econometric methodology and empirical results can be seen below.

**ECONOMETRIC METHODOLOGY**

Hatemi-J (2008) has developed a new cointegration test allowing two structural breaks in order to analyze the relationship among variables whilst Gregory-Hansen cointegration test (1996) allowing the single structural break.

The following model is taken into account in Hatemi-J cointegration test;

\[ y_t = \alpha_0 + \alpha_1 D_{1t} + \alpha_2 D_{2t} + \beta_0' x_t + \beta_1' D_{1t} x_t + \beta_2' D_{2t} x_t + u_t \]

Dummy variables located here are defined as follows;

\[ D_{1t} = \begin{cases} 0 & \text{if } t \leq [nt_1] \\ 1 & \text{if } t > [nt_1] \end{cases} \]

\[ D_{2t} = \begin{cases} 0 & \text{if } t \leq [nt_2] \\ 1 & \text{if } t > [nt_2] \end{cases} \]

In this model \(\alpha_0, \alpha_1 \) and \(\alpha_2\) respectively indicate the constant term prior to structural changes, the change in the constant term by reason of the first structural break and
the second structural change. Likewise, $\beta_0$, $\beta_1$ and $\beta_2$ indicate the slope parameter prior to structural changes, the impact of the first and the second structural change in the slope.

The null hypothesis shows no cointegration between variables; on the other hand the research hypothesis indicates cointegration between variables under two structural breaks. Findings obtained have been determined with ADF test. The model is estimated by using all possible break dates and then break pairs which give the smallest test statistic are chosen as the appropriate break dates in Hatemi-J test as in Gregory-Hansen test (Yılancı, 2013).

There is no difference between Hacker-Hatemi-J (2006) and Toda-Yamomoto (1995) causality test except obtaining critical values with bootstrap despite the possibility of not normally distributed of errors. The causality relationship between two series is tested by using the following delayed vector autoregressive model (VAR):

$$y_t = \alpha + A_1 y_{t-1} + \cdots + A_p y_{p-1} + u_t$$

In this mode $y_t$ refers to variable vector in 2x1 dimension and $A$ state parameter vector. In order to obtain Wald statistics that will be used test null hypothesis showing no Granger-causality between series, VAR model represented in this equation is as follows;

$$Y = DZ + \delta$$

Here the research hypothesis suggests the causal relationship between the series. The null hypothesis which doesn't demonstrate Granger causality between variables can be tested with the following wald test statistics;

$$W = (C\beta)]I\left[ C(Z^1Z)^{-1} \otimes Su \right) C^{-1} (C\beta)$$

Here, $\otimes$ refers to the Kronecker multiplier and $C$ demonstrates the indicator function containing restrictions. Also $\beta$ is of the form $\beta=vec(D)$ and vec represent the column stacking operator. $q$ shows the number of lags in each VAR equality, $Su$ represents the calculated variance-covariance matrix for the unrestricted VAR model as $(\cdot\cdot\cdot)^\prime(\cdot\cdot\cdot)$.

The frequency domain causality test analyzes the causality by considering different frequencies whether it is temporary or permanent. In other words, this test takes into account the long-term information loss (Bozoklu and Yılanç, 2013). The null hypothesis represents no causality in frequencies; in opposition to the research hypothesis refers to the existence of causality in the frequency domain causality test which was developed by Geweke (1982), Hosoya (1991), Breitung and Candelon (2006). Accordingly, it can be determined whether causality has permanent or temporary effects. We did not conduct a complete literature review. For recent surveys, please see Adıgüzel et al., (2013) and Kayhan et al., (2013).

**DATA AND EMPIRICAL RESULTS**

In this study monthly data are discussed from the period of January 2008 to December 2012. Data related to consumer confidence index obtained from statistical database of the Central Bank of the Republic of Turkey (TCMB) and data expressing online credit card usage was obtained from the official web site of Interbank Card Center (BKM). Credit card data includes only domestic usage of domestic credit cards. The reason for this condition is the other variable consumer confidence index has only data for Turkey. Moreover, data for the online using of credit cards has been
calculated with division of total amount of transaction to total number of transaction, and included in the analysis in terms of amount per unit. Logarithmic transformation of the series is taken in order to avoid problems of heteroscedasticity before proceeding to the analysis.

Determining the degree of stability of variables for model selection is very important in the investigation stage of cointegration and causality relationship between the variables. From this point, the degree of stability of the series is determined with the ADF unit root test in our study.

### Table 1: Results for ADF Unit Root Test

<table>
<thead>
<tr>
<th></th>
<th>Consumer Confidence Index</th>
<th>Credit Card Using</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>-1.46(0.54)</td>
<td>-2.10 (0.24)</td>
</tr>
<tr>
<td>1st difference</td>
<td>-5.84(0.00)**</td>
<td>-5.03(0.00)**</td>
</tr>
</tbody>
</table>

Note: *** denote rejection of null hypothesis at the %10 level.

According to the ADF unit root test, although the all series contains a unit root in level, the stability was observed when calculated 1st difference. In such a case, it is possible to examine the cointegration relationship between these two series.

### Table 2: Results for Hatemi-J Two-breaks Cointegration Test

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>First Break</th>
<th>Second Break</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6.61***</td>
<td>October-2008</td>
<td>February-2011</td>
</tr>
</tbody>
</table>

Note: Critical values are -6.50, -6.01 and -5.65 at 1%, 5% and 10% significance levels respectively as for one independent variable specified by Hatemi-J (2008, pp. 501).

It's seen that consumer confidence index and online credit card using have an integrated structure according to the results of Hatemi-J cointegration test (2008) which allows two structural breaks. In other words, these two series are cointegrated and move together in the long term. Further wherein, it is supporting the selection of the correct model that the first break date coincides with the period of the 2008 global financial crisis by considering the structural breaks. In this context, it is seen that consumer trust and online credit card using have a strong relationship. Positive and negative movements are observed analogously in these two series. This can be approved with the aid of the Figure 1. This graph demonstrates a parallel trend between logarithmic transformations of these two series.

### Figure 1: Chart of Series
When it comes to causality test results, primarily classical Toda-Yamamoto (1995) causality test is used and the causality has been determined from consumer confidence index to credit card using. Nonetheless, the causality test values are not significant from credit card using to consumer confidence index, but very close to the relationship with the 0,10 significant value.

**Table 3: Results for Toda Yamamoto Causality Test**

<table>
<thead>
<tr>
<th>Causality</th>
<th>Test Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCI &gt; CCU</td>
<td>45.10 (0.00)***</td>
</tr>
<tr>
<td>CCU &gt; CCI</td>
<td>14.53(0.10)</td>
</tr>
</tbody>
</table>

Note: *** denote rejection of null hypothesis at the %10 level

However, Hacker and Hatemi-J (2006) bootstrap causality test results vary from these findings. These results can be observed from Table 4.

**Table 4: Results for Hacker and Hatemi-J Bootstrap Causality Test**

<table>
<thead>
<tr>
<th>Causality</th>
<th>Test Statistic</th>
<th>Bootstrap Critical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% 1</td>
</tr>
<tr>
<td>CCI &gt; CCU</td>
<td>0.27</td>
<td>6.70</td>
</tr>
<tr>
<td>CCU &gt; CCI</td>
<td>0.03</td>
<td>6.64</td>
</tr>
</tbody>
</table>

According to Hacker and Hatemi-J (2006) test which calculates the critical values with bootstrap monte carlo simulation despite the possibility of not normally distributed of errors, no causality relationship is observed between these two series.

**Table 5: Results for Frequency Domain Causality Test**

<table>
<thead>
<tr>
<th>ω₁</th>
<th>Permanent</th>
<th>Temporary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.01</td>
<td>0.05</td>
</tr>
<tr>
<td>CCI &gt; CCU</td>
<td>1.43</td>
<td>1.44</td>
</tr>
<tr>
<td>CCU &gt; CCI</td>
<td>1.91</td>
<td>1.92</td>
</tr>
</tbody>
</table>

Note: * denote rejection of null hypothesis at the %1, level.

The causality result which is seen in Toda Yamamoto (1995) causality test is not seen in Hacker and Hatemi-J (2006) causality test. This result is revealed that the causality is not clear and an in-depth examination is necessary. At this point, frequency domain causality test which can analyze temporary and permanent effects of causality by distinguishing is used. When compared the results of Table 5, there is no causality from credit card using to consumer confidence index as in the previous two tests; conversely the causality from consumer confidence index to credit card using has a temporary structure. The reason why there is no relationship between these variables in Hacker and Hatemi-J (2006) bootstrap test can be associated with these results. High and low test frequencies used by Adigüzel et al., (2013) and Bozoklu and Yılançı (2013) are used in order to measure temporary and permanent causal dynamics.
CONCLUSION AND DISCUSSION

Online shopping inherently includes intangibility and uncertainty. These uncertainties raise several risks for consumers. These risks influence consumption expenditures and usage of expenditure tools negatively in the Internet environment. Trust is the concept that decreases and removes this impact without doubt. The increase in online applications also increases the willingness to expenditures and credit card using. For this reason, it can be said that consumer confidence index as a trust tool has a very critical role in online credit card using.

In this study, it’s concluded that consumer confidence index and online credit card using have an integrated structure via Hatemi-J cointegration test (2008). In other words, these two variables move together in the long term. Furthermore, causality relationships between the variables have been analyzed with the help of several causality tests such as Toda-Yamamoto (1995), Hacker and Hatemi-J (2006) and Frequency. According to the results of these tests, no causality from online credit card using towards consumer confidence index has been found; conversely a temporary causality from consumer confidence index towards online credit card using has.

It can be expressed that the reason of this temporary causality from consumer confidence index towards online credit card using is the inclusion of only consumer confidence index as a trust indicator. It is thought factors not included in the model such as systematic, organizational or personal trust also affect online credit card using. In addition, usage of consumer confidence index mostly as an economic indicator and determining of the expenditure and debt trends according to fiscal situation can be shown as a second reason.

As a result, studies conducted by Chu et al., 1997; Manchala 1998; Ratnasingham, 1998; Friedman et al., 2000; Gefen, 2000; Schneiderman, 2000; Viega et al., 2001; Chelappa and Pavlou, 2002; Tan and Thoen, 2002; Dahlberg et al., 2003; Hwang et al., 2003; Kim and Benbasat, 2003; Al-Dalain et al., 2008; Mangiaracina and Perego, 2009; Buccafurri and Lax, 2011; Shu and Cheng 2012 have been supported in the literature and these findings have revealed the importance of trust in online shopping once more with the help of this econometric study.

In future studies, including various other trust factors to the model and creating panel data models with considering more countries will further strengthen the present findings and reveal more accurate results.
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