FROM SEARCHING ON THE INTERNET TO BUYING ONLINE: A SIMPLE LINEAR REGRESSION MODEL

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Abstract.

Before making an actual purchase, a significant share of the European population search for information about the goods and services on the Internet. Online searching for information cannot guarantee an online purchase since consumers can switch channels with little cost. However, countries that report a high percentage of the population searching online for information about goods and services also report a high e-commerce adoption rate.

This article tests and validates a direct linear relationship between the adoption of the Internet as a search tool for products and goods and the adoption of e-commerce among the population. The Least Square Method was employed to a sample of data from 26 European countries.

Keywords: Internet search, Internet buying, online buying

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Introduction

E-commerce is spreading fast in European countries as more people have access to broadband connection and adopt the Internet for various purposes. In 2009, 60% of the European population were frequent Internet users, using the Internet on a regular basis (European Commission, 2010). Moreover, according to the same source, broadband Internet connection was available to 94% of the European population and it was accessed by 56% of the households. Between 2008 and 2010, domestic B2C e-commerce has raised from 28% to 36% of the population making online purchases (goods and services) for private use (European Commission, 2011). The European Union B2C e-commerce market was estimated at 91 billion euro in 2010, amount the represents 3.5% of the total European Union retail sector (European Commission, 2011).

European Commission observed that although e-commerce has registered a strong growth rate in the last year, its full potential has not been reached: "There are still considerable obstacles holding back both consumers and business" (European Commission, 2011).

Consumers turn to e-commerce as an alternative buying channel due to perceived benefits such as lower prices, convenience, the possibility to save time and to choose from a wide range of products and vendors (European Commission, 2011).

E-commerce is convenient meaning that consumers can buy online despite time and place constraints. Consumers can gather information, order products or services and pay online from their own homes or offices. No need to dress up, to drive to the store, to deal with nosy sales people, to stay in line at check-up or to transport and handle goods home. Convenience as a top motivation for adopting e-commerce by the population was empirically tested in validated in various empirical studies (Margherio, 1998; White and Manning, 2001; Chiang and Dholakia, 2003; Saprikis et al, 2010; Gurvinder and Chen, 2004).

But e-commerce is not just convenient, it also saves time. But not having to dress up, to drive to and from the store, or from store to store, consumers engage in time savings. There is empirical evidence that saving time is one of the top reasons why consumers choose this alternative way of buying using the Internet (Khalifa and Limayem, 2003; Gurvinder and Chen, 2004).

With little or no barriers to enter the online market, various online vendors offer similar products online which results in high competition. The consumers are the ones that benefit from an increased competition because online vendors decrease prices. Moreover, many online vendors offer incentives and bargains for buying online just for stimulating e-commerce adoption. Thus, consumers perceive lower prices in online market which motives them to complete orders for goods and services (Khare and Rakesh, 2011; Khalifa and Limayem, 2003; Gilly and Wolfinbarger, 2000; Saprikis et al, 2010).

The Internet offers huge volumes of information about goods and services, easing consumers' selection process (Gilly and Wolfinbarger, 2000; Gurvinder and Chen, 2004).

Perceived usefulness and online buying

The usefulness of e-commerce consisting in the various benefits described above is a strong predictor of consumers' intention to engage in e-commerce and actually purchase online. Perceived usefulness is a construct of the Technology Acceptance Model, a model that explains and predicts the intention of adopting an information system based on the attitude towards the information system and perceived usefulness of the information system (Davis, 1989). When confronted with a new information system consumers form beliefs about the benefits of adopting it. Technology Acceptance Model has been adapted and successfully validated to the study of e-commerce adoption among consumers (Said, 2011; Shang et al, 2005; Ahn et al, 2004; Shih, 2004; Liu si Wei, 2003; Yoon, 2009; O'Cass si Fenech, 2003; Lui si Jamieson, 2003; Shin, 2008.

Consumers' adoption of e-commerce cannot be solely explained by perceived usefulness. There are other factors that contribute to a manifested intention to buy online.

Internet use and Online Buying

On one hand there is consumers' familiarity with the Internet. Yoh et al describes familiarity with the Internet as the use of the Internet for other purposes than searching, ordering and paying for goods and services. For example a consumer may use e-mail services, social network services, instant messaging or he or she may read online newspapers or play different games. Yoh et al empirical research validates the assumption that familiarity with the Internet is a strong predictor of online buying behaviour (Yoh et al, 2003).

Familiarity with the Internet was also studied by Eastin and Said. Eastin referred to Internet use a variable that encompasses the volume of time spent online both for fun and work/study purposes. Eastin's empirical research shows a significant direct relationship between Internet use and e-commerce adoption (Eastin, 2002). Said, however, found an indirect relationship between prior use of the Internet and the intention to buy online (Said, 2011).

Internet Search for goods and services and Online Buying

Before making an actual purchase, consumers engage in information research. For example, European consumers use different research methods, as reported by the European Commission: 31% of the consumers visit the online vendors' website, 30% of the consumers use a search engine, 27% of the consumers used a price comparison website and 24% of the consumers read online reviews (European Commission, 2011).

Authors, such as Klein recommend the study of the relationship between search process and online consumers behaviour, since search behaviour is a critical predictor of buying behaviour (Klein, 1998).

Jamiszewski shows that are two types of consumers that engage in research related activities:

- Consumers that gather information prior to a purchase
- Consumers that search for the fun of exploration, with no specific target in minds that lead to an actual purchase (Jamiszewski, 1998)

Taking in consideration both types of consumers, To et al develop and test an empirical motivational model of consumers' intention to buy online. The authors suggest that both utilitarian motivations (perceived utility we have discussed in an early section) and hedonic motivations influence consumers' intention to search online for goods and services. Moreover, the intention to search online for goods and services has a direct influence on the intention to actually buy online. The standardized coefficient between search intention and purchase intention having a value of 0.44 which means that search intention is a strong predictor of purchase intention (To et al, 2007).

The relationship between the intention to use the Internet for information search and the intention to use the Internet for purchasing is also studied within Shim et al model. The authors report a 0.70 standardized coefficient between search intention and purchase intention, reinforcing again the assumption that search intention is a strong predictor of purchase intention (Shim et al, 2001).

Purpose of this study and methodology

Previous studies have shown that the intention to search on the Internet for goods and services is a strong predictor of the intention to buy online goods and services. The first difference between previous studies and current study is the type of variables employed. This study employs actual use of the Internet as a searching tool for goods and services (as % of the entire population searching online for goods and services for private use) and actual e-commerce adoption rate (as % of the population that actually made an online purchase within the last 12 months). The second difference between previous studies and current study is the sample of data used. This study uses a sample of data from 26 European countries as reported by the European Commission (European Commission, 2010). The third difference between previous and current study is the method used for validating the relationship between the adoption of the Internet for searching for goods and services and adoption of e-commerce among population. Previous models employed structural equation modelling for testing the relationship among various other relationships in general online consumer behavioural models. For testing the linear direct relationship between searching on the Internet for goods and services and the adoption of e-commerce, Least Square Method performed by EViews software version 4.1 was employed. The model assumed that:

ECOMM = f (SFGOOD) + r

ECOMM = a + b*SFGOOD + r, where

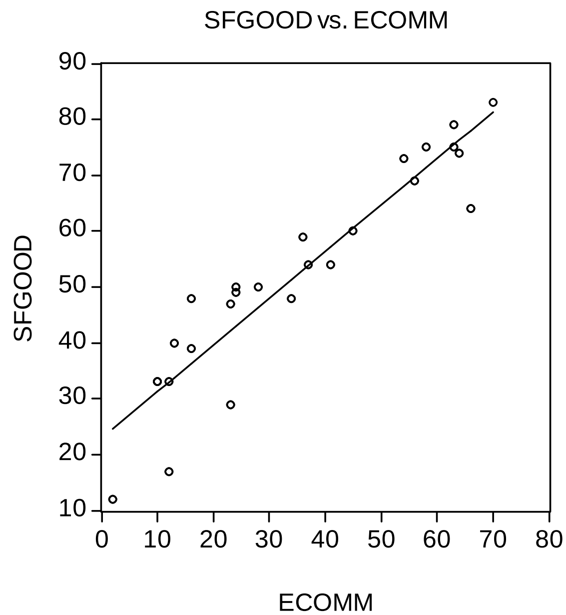
ECOMM = % of the population ordering online goods and services for private use

SFGOOD = % of the population that searches on the Internet for private goods and services.

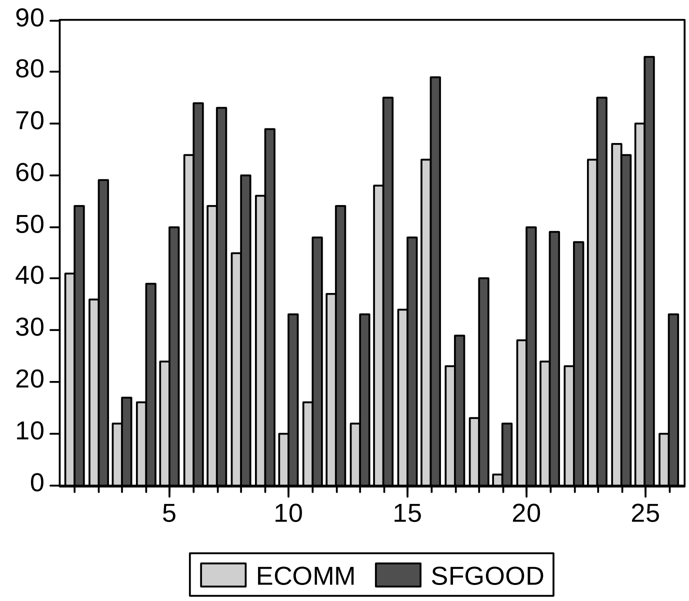
The model is further test for meeting validity hypothesis.

Data analysis and results

The Scatter plot and the Bar Graph below indicate a positive and direct relationship between search and e-commerce adoption that needs to be further integrated into a simple regression model:



Graph 1: Scatter plot ecomm vs sfgood



Graph 2: Bar Graph ecomm vs sfgood

After estimating parameters, the model becomes:

ECOMM = 1.03SFGOOD – 19.13 (See Table 1).

The model is capable of explaining 86.61% of the variation of e-commerce adoption among the population as R squared is 0.8661.

Dependent Variable: ECOMM				
Method: Least Squares				
Included observations: 26				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SFGOOD	1.037463	0.083250	12.46196	0.0000
C	-19.13316	4.584151	-4.173763	0.0003
R-squared	0.866146	Mean dependent var		34.61538
Adjusted R-squared	0.860569	S.D. dependent var		21.20958
S.E. of regression	7.919746	Akaike info criterion		7.050399
Sum squared resid	1505.337	Schwarz criterion		7.147176
Log likelihood	-89.65519	F-statistic		155.3005
Durbin-Watson stat	2.236653	Prob(F-statistic)		0.000000

Table I. Parameter estimation using OLS

Student Test

In order to test the significance of the linear regression model, the Student Test was employed. Using t-Student we observe that there is a positive linear dependence among e-commerce adoption and Internet used as a search tool for goods and services. For arriving at such statement a couple of steps were implemented, following Andrei and Bourbonnais approach (Andrei and Bourbonnais, 2008):

- Defining t-Student hypotheses

H0: The coefficient of independent variable doesn’t differ significantly from 0

H1: The coefficient of independent variable is significantly different from 0

- Defining t-Statistic (See table 1)
- The decision of the Student Test

For a defined threshold of significance (0.05) and n=26 observation, we take from the Table of t Student distribution the value of 1.711 which we compare with t-Statistic.

If t-Statistic > t value from the t Student distribution table, then H0 is not validated, which means that there is a significant linear dependency between the two variables.

Moreover, between the value of F statistic and t statistic, which corresponds to the slope of the regression, the relationship $t^2 = F$ is verified (Andrei and Bourbonnais, 2008)

Durbin-Watson Test

Durbin-Watson Test verifies that the residuals from a linear regression are independent (Montgomery et al, 2001) and it involves the following steps:

- Defining Durbin-Watson hypotheses:

  H0: p=0 (there is no autocorrelation among residuals)

  H1: p>0 (the residuals are auto correlated)
- Computing d (Durbin Watson test statistic) – see Table 1
- The decision of the test

The d value is compared with dU and dL (upper and lower critical values) that have been tabulated for different values of k (the number of independent variables) and different values for n (number of observations).

In order to accept the null hypothesis (H0) the following relationship must verify:

dU < d < 4 – dL

Which in our case, for one independent variable and 26 observations, the relationship becomes: 1.30<2.23<4-1.46.

White Test

The White Test is used to state whether homoscedasticiy hypothesis of the model can be supported. Homoscedasticity requires that the variance of the residual values remains constant for all the values of the explanatory variable (Mukras, 1993).

The White Test computed by EViews software shows a value of F-statistic of 0.8152 (See Table II). The decision of the test consists of comparing the F-statistic with the F-value from F Repartition Table for v1 and v2 degrees of freedom, values that have been tabulated for different values of k (the number of independent variables) and different values for n (number of observations). In our case:

F-statistic (0.81) < F-value (4.26), which means that heteroscedasticity is not present in current model (Andrei and Bourbonnais, 2008).

F-statistic	0.815260	Probability		0.454908
Obs*R-squared	1.721179	Probability		0.422913
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Included observations: 26				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	112.3315	99.81771	1.125367	0.2720
SFGOOD	-0.968412	4.198879	-0.230636	0.8196
SFGOOD^2	-0.001406	0.041294	-0.034045	0.9731

Table II. White Heteroskedasticity Test

Jarque-Bera Test

Jarque Bera Test is used to decide whether the residual values have a normal distribution.

H0: residual values follow a normal distribution N(0,1)

H1: residual values don't follow a normal distribution N(0,1)

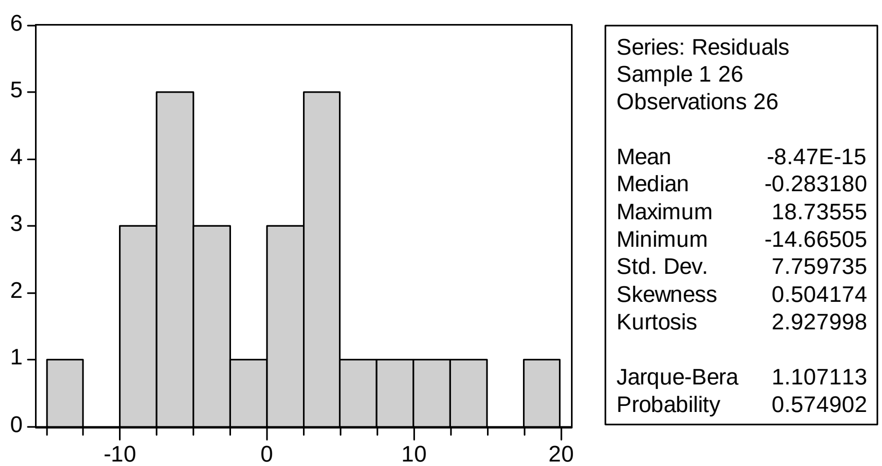


Table III. Jarque Bera Test

Jarque-Bera statistic test was computed using EViews and a value of 1.107 was obtained (See Table III). The Jarque Bera value is further compared with the value from Chi Squared Distribution Table, values tabulated for different threshold significance and degrees of freedom. Another way we can validate that the residual values have a normal distribution is comparing the asymmetry coefficient (skewness) to see if it is close to 0 and the flatness coefficient (Kurtois) to see if it is close to 3 (Andrei and Bourbonnais, 2008)

Using either method, our null hypothesis is accepted meaning that the residual values follow a normal distribution.

Conclusion

Consumers' intention to buy online and actual online purchase behaviour has been an intense field of research in the last decade. Various researchers have employed different constructs for explaining both the intention to use the Internet to buy online and the actual use of the Internet for buying goods and services for private use. Search intention, or consumers' intention to use the Internet as a search tool in their research process has been validated as a strong predictor of buying intention.

However, current research test and validates the direct linear dependence between actual use of the Internet as a search tool (% of the population searching online for information about goods and services) and actual e-commerce adoption (% of the population buying online goods and services for private use). The Least Square Method shows a strong linear dependence between the two variables and the model can explain 86.61% of the variance of e-commerce adoption. This yields serious implications for marketing managers. Since the two variables are strongly correlated, it's up to online vendors to transform visitors into clients. A consumer not only can switch rapidly between online vendors, but he or she can switch channels with little or no cost.

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