# Limited Asset Market Participation: Evidence From Household Data[*]

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## Abstract

As a first step in uncovering the implications of limited asset market participation, we model the decision of a household to participate in asset markets. We run a probit regression to estimate the probability of share ownership. We use Italian household data on age, education, occupation and geographical area of residence from the Survey of Household Income and Wealth collected by the Bank of Italy. Our results suggest that all these factors are important in determining share ownership.

Key Words: Limited asset market participation, discrete-choice models
JEL Classification: C25, G11

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# 1 Introduction

Limited asset market participation continues to be a predominant characteristic of even some of the most developed financial systems around the globe. The fact that a majority of households do not participate in asset markets despite the equity premium and the additional insurance possibilities provided by holding assets is puzzling. Understanding the nature and extent of this puzzle is not only interesting from a theoretical standpoint but is also necessary to evaluate its potential implications for a variety of policy questions.

An important policy issue is concerned with the distributional consequences of a change in capital income taxation (Haliassos and Lyon (1994)). Debates regarding the nature and extent of various tax cut proposals and their implications for the economy highlight the relevance of this question for economic policy. The composition of asset market participants is indispensable to an evaluation of the consequences of any such policy change. Privatization is another area of policy for which the extent of market participation matters. The success of such an undertaking by any emerging economy as well as developed countries such as United Kingdom hinges on whether or not a broad and reliable base of market participants exist. Another aspect that has been studied by Allen and Gale (1994) focuses on how the volatility of asset prices is affected by the degree of market participation.

The fact that a significant portion of households do not participate in asset markets is well documented. According to the 1983 Survey of Consumer Finances (SCF), the proportion of households in United States that hold stocks either directly or through mutual funds is well below 50 percent except for the top quintile of income [5]. Data from the 1989 Survey of Consumer Finances reveal that 59 percent of U.S. households do not hold any nonmonetary financial assets (interest-bearing assets) [8]. [3] Using the Panel

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[3]Interest-bearing financial assets are money-market accounts, CDs, other bonds, mutual fund shares, and equities.

Study of Income Dynamics (PSID), Mankiw and Zeldes (1991) also document that only a small proportion of households holds stocks. In a more recent study, Vissing-Jørgensen (2002) uses the Consumer Expenditure Survey (CEX) where she classifies 21.75 percent of households as stockholders. The phenomenon of limited market participation is evident in other developed economies as well. Attanasio, Banks and Tanner (2002) state that more than 75 percent of U.K. households do not own shares directly while a level of share ownership greater than 20 percent is a recent phenomenon.

As emphasized in the literature, asset market participation is neither a permanent nor an exogenous state of affairs. The goal of this paper is to shed light on the underlying causes of limited asset market participation by studying evidence from micro household data. A first step in this effort is modelling the household decision to participate in asset markets.

The rest of the paper is organized as follows: Section 2 summarizes some alternative approaches taken in the literature and presents their findings. Section 3 describes the dataset. Section 4 discusses the empirical approach and presents the results. Section 5 concludes with remarks and ideas for future research.

## 2  Related Literature

Previous studies have suggested that factors such as age, education, occupation, income and attitude towards risk play an important role in determining whether a household participates in asset markets or not.

Haliassos and Bertaut (1995) investigate a number of possible candidates to explain the stockholding puzzle using data from 1983 Survey of Consumer Finances. They perform a logit estimation using 4,103 observations from the 1983 Survey of Consumer Finances. They employ two categories of variables to estimate the probability of holding stocks. The first category includes 'fundamental' variables that include labor income, financial

net worth, age as a proxy for life-cycle stage and a horizon dummy identifying willingness to trade liquidity for higher long term returns. In addition, three occupational dummies identifying low-risk occupations other than managers, managers, and high-risk occupations are used to account for business cycle risk considerations. All other occupations are captured by the omitted dummy. The second category of variables are the 'inertial' variables. Sex, race and marital status are used to capture cultural sources of inertia. Informational considerations constitute another source of inertia. Educational dummies consist of dummies for less than high school education, high school education and only some college, while the omitted dummy identifies those with at least a college degree. A managerial occupation dummy is also used to identify those who acquire information and/or stock costlessly. A dummy for inheriting a majority of wealth is used in lieu of information on stock inheritance. Attitude towards risk is captured by two dummies for moderate and considerable willingness to trade risk for higher expected return.

Their results yield positive and statistically significant coefficients for income and financial net worth. Willingness to trade liquidity for higher long term returns increases the probability of holding stocks which is cited as supporting the view that stocks are attractive for long term investment. Age variables turn out to be insignificant. This finding suggests that horizon effects are captured by the liquidity variable. It also provides evidence against the assumption that information about stockholding arrives exogenously and randomly over time with the implication that age increases the probability of stockholding. As for business cycle considerations, they find that the probability of stockholding for those in low-risk occupations is not different from those in occupations that could not be classified as either low-risk or high-risk (the omitted dummy). However, the probability of holding stocks is found to be significantly higher for managers who are considered to be a low-risk occupation. This deviation is attributed to informational considerations rather than business cycle risk considerations. It is less likely for households in high-risk

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occupations to hold stocks at the 10 percent level of significance but not at the 5 percent level of significance. While sex and marital status do not seem to affect the decision to hold stocks, non-whites are less likely to hold stocks which might result from the fact that brokers primarily target whites. Households who have not attended college or have some college education are less likely to hold stocks than those with a college degree. Having access to insider information or receiving stocks as part of income as captured by managerial occupation dummy increases the probability of holding stocks compared to the omitted occupational dummy. Inheriting the majority of wealth does not affect stockholding probably because it is not a good proxy for inheritance of stocks as suggested by low incidence of stockholding in the group. Finally, the probability of stockholding decreases as the degree of risk aversion increases.

Attanasio, Banks, and Tanner (2002) study the implications of limited participation in asset markets, and the stock market in particular for asset pricing models based on Euler equations for consumption. In order to do so, they focus on the evidence on share ownership in the United Kingdom. They estimate a probit regression of share ownership using pooled data from the U.K. Family Expenditure Survey for the period 1978-95 for a total of 83,736 observations. Their specification for the probit model limits the variables used to predict asset ownership to those that are either constant over time or evolve in a predictable way. The choice of variables are age, education and time trend. The specification is a very flexible one that includes higher orders of age and time. They also interact time with age and education to account for the observation that the effects of the latter two variables appear to change over time.

Their results show that the probability of asset ownership increases with age, time, and higher levels of education. However, the positive effect of higher education on share ownership tends to diminish over time. These findings concur with the evidence on share ownership from the U.K. Family Expenditure Survey.

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# 3   Data

This study uses Italian household data from the Survey of Household Income and Wealth (SHIW) constructed by the Bank of Italy. Collected as part of the Bank of Italy Historical Database of the Survey of Italian Households Budgets, the SHIW spans the period 1977-2000 for a total of 16 cross sections. There have been numerous changes with respect to how the SHIW questionnaire is conducted over this period. For example, until 1987, the survey is conducted with time-independent samples of households. Since 1989, part of the sample is comprised of households that were interviewed in previous surveys adding a panel component to the dataset.

The Historical Database (HD) includes a wide range of information on households. In particular, it contains data on the characteristics of the individuals and their occupational status, the different sources of income (payroll and self-employment income, pensions, transfers, and property income) of household members, expenditure (durables and non-durables), the properties lived or owned by the household, and household financial assets and liabilities. The information on household financial assets and liabilities is rich and detailed. Among the categories of financial assets included are bank deposits in current accounts, bank deposits in savings accounts, BOTs (T-bills), other government securities (CTEs, CTOs et al.), bonds, and shares.

This study focuses on share holdings as the variable of interest with respect to asset market participation. Table 1-4 summarize the incidence of share holdings among Italian households according to age, educational qualification, occupational category and geographical area of residence. Table 1 reveals that share ownership increases with age until it reaches its highest percentage for the age group 41-50 and declines thereafter.

Education appears to be a very important factor for share ownership with hardly any share owners among those with no education compared to a 17 percent ownership for

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those with a bachelor's degree or a post-graduate qualification.

Among occupation categories, managers have the highest incidence of share ownership, an observation that concurs with the findings of Haliassos and Bertaut (1995). Members of the arts or professions follow with second highest percentage of share holdings.

Share ownership by geographical area reveals a particular characteristic of the development and sophistication of financial institutions in Italy. In general, there is less penetration of financial instruments in the South which might be partly due to the lower standard of living in this region. Lower level of holdings for most of financial instruments is still evident even controlling for wealth. In particular, the incidence of share ownership is considerably lower in the South than in the North with Central Italy lying in between.

The estimations presented in this paper use pooled data from 7 cross sections covering the period 1987-2000 for a total 38,811 observations. The panel component is excluded to defer an explicit treatment of fixed effects and to provide results which are more readily comparable to the previous findings in the literature presented above.

# 4  Econometric Analysis

## 4.1  Empirical Specification

As a first step in the econometric analysis of the household decision to participate in asset markets, probit estimation of a discrete- choice model is performed. The dichotomous dependent variable $y$ takes on a value of 1 if the household has holdings of shares at the end of the year and 0 otherwise. First, a baseline participation equation is estimated using age, dummies for educational qualification, time trend as well as a constant as independent variables. For a more flexible specification, higher orders of age and time are also included. Interactions of time with age and education are added to allow for the possibility that the effect of these factors may change over time.

Baseline Participation Equation:

$$
\begin{aligned}
y_i^* \; = \;\; & \alpha_0 + \alpha_1 \text{Age}_i + \alpha_2 \text{Age}_i^2 + \alpha_3 \text{e1}_i + \alpha_4 \text{e3}_i + \alpha_5 \text{e4}_i + \alpha_6 \text{e5}_i \\
+ \;\; & \alpha_7 (\text{Age}_i \text{xe1}_i) + \alpha_8 (\text{Age}_i \text{xe3}_i) + \alpha_9 (\text{Age}_i \text{xe4}_i) + \alpha_{10} (\text{Age}_i \text{xe5}_i) \\
+ \;\; & \alpha_{11} \text{t} + \alpha_{12} \text{t}^2 + \alpha_{13} \text{t}^3 + \alpha_{14} \text{t}^4 + \alpha_{15} \text{t}^5 + \alpha_{16} (\text{Age}_i \text{xt}) + \alpha_{17} (\text{Age}_i \text{xt}^2) \\
+ \;\; & \alpha_{18} (\text{e1}_i \text{xt}) + \alpha_{19} (\text{e3}_i \text{xt}) + \alpha_{20} (\text{e4}_i \text{xt}) + \alpha_{21} (\text{e5}_i \text{xt}) + \epsilon_i
\end{aligned}
$$

with

$$
y_i = \begin{cases} 1 & \text{if } y_i^* \geq 0 \\ 0 & \text{otherwise} \end{cases}
$$

where $\text{Age}_i$ refers to the age of the household head $i$, t denotes time (or trend), and e1...e5 are the educational qualification dummies. The omitted dummy e2 identifies household heads with middle school education. Next, a more comprehensive version of the participation equation is estimated. This extended specification includes dummies for geographical area of residence, a1...a3 as well as dummies for occupational categories, q1...q7. The omitted dummy for the geographical area of residence is a2 identifying households from Central Italy. As for the occupational categories, the omitted dummy q1 identifies blue-collar workers. (A detailed list of all dummies is provided in the Appendix) The results detailed in the next subsection focus on this extended version of the probit estimation while the baseline specification is provided as a benchmark. The estimation results from the baseline probit model also provide a comparison to the study by Attanasio et al. (2002) which uses a different data set to estimate a similar specification.

Participation Equation:

$$
\begin{aligned}
y_i^* =\ & \beta_0 + \beta_1 \text{Age}_i + \beta_2 \text{Age}_i^2 + \beta_3 \text{e1}_i + \beta_4 \text{e3}_i + \beta_5 \text{e4}_i + \beta_6 \text{e5}_i \\
& + \beta_7 (\text{Age}_i \text{xe1}_i) + \beta_8 (\text{Age}_i \text{xe3}_i) + \beta_9 (\text{Age}_i \text{xe4}_i) + \beta_{10} (\text{Age}_i \text{xe5}_i) \\
& + \beta_{11} \text{t} + \beta_{12} \text{t}^2 + \beta_{13} \text{t}^3 + \beta_{14} \text{t}^4 + \beta_{15} \text{t}^5 \\
& + \beta_{16} (\text{Age}_i \text{xt}) + \beta_{17} (\text{Age}_i \text{xt}^2) + \beta_{18} (\text{e1}_i \text{xt}) + \beta_{19} (\text{e3}_i \text{xt}) + \beta_{20} (\text{e4xt}) + \beta_{21} (\text{e5}_i \text{xt}) \\
& + \beta_{22} \text{a1}_i + \beta_{23} \text{a3}_i + \beta_{24} \text{q2}_i + \beta_{25} \text{q3}_i + \beta_{26} \text{q4}_i + \beta_{27} \text{q5}_i + \beta_{28} \text{q6}_i + + \beta_{29} \text{q7}_i + \varepsilon_i
\end{aligned}
$$

with

$$
y_i = \begin{cases} 1 & \text{if } y_i^* \geq 0 \\ 0 & \text{otherwise} \end{cases}
$$

The model is estimated using maximum-likelihood estimation.

## 4.2 Results

The results of the probit estimation for share ownership are presented in Table 5. The binary dependent variable is a dummy indicating share ownership at the end year. Independent variables are age of the household head, time (or trend), and dummies for educational qualification, occupational category, and geographical area of residence as well as a constant.

The first three columns report the estimated coefficients together with standard errors and t-ratios. The coefficient for age is found to be positive and statistically significant. Same result is obtained for the time variable. The coefficients for all educational dummies are positive and they are significant except for no or elementary education group. The coefficients for geographical area dummies are both significant. The dummy for residence in North Italy has a positive coefficient whereas the coefficient on the dummy for residence in South Italy and Islands turns out to be negative. The coefficients on all occupational categories are found to be positive and significant. As for the interactions, only the coefficients for interactions of lowest educational category (no or elementary education)

with time and age turns out to be significant. The sign of an estimated coefficient gives the direction of the effect of a change in the explanatory variable on the probability of a success, in this case, an observation of share ownership. For example, the positive estimated coefficient on age suggests that an increase in age gives a higher probability of share ownership by a household. However, the estimated coefficients do not have a direct economic interpretation. A more intuitive interpretation of the estimation results for the probability of share ownership is provided by the marginal effects reported in the last column of Table 5.

The estimates of the marginal effects are obtained by rescaling the estimated coefficients. Since the scale factor varies with the observed values of explanatory variables, the marginal effects reported in Table 5 are evaluated at the sample means. Results reveal that a one year increase in age leads to a 0.004 increase in the probability of share ownership, holding all else constant. This finding concurs with the empirical observation that shareholders, on average, tend to be older than the rest of the population. It is also consistent with some simple specifications regarding exogenous information revelation. More particularly, the idea that information about share holding arrives exogenously and randomly over time and hence age increases the probability of share holding is supported by this result. (King and Leape (1987)). The positive effect of time trend on the probability of share ownership is emphasized by a marginal effect of 0.019.

For the dummy variables, marginal effects give the change in probability of share ownership that results from changing the relevant dummy variable from 0 to 1, holding all other variables constant at some fixed value. These values are set at the modal values for dummy variables and sample means for other variables. Findings for educational dummies imply that higher education levels are associated with a higher probability of holding shares. As the level of educational qualification increases, the marginal effect of education increases as well. The effect of education on probability of share ownership

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might be attributed to the information costs associated with market participation. For educated households, these costs are expected to be lower due to their higher capability to process information.

The implications of geographical area of residence for probability of share ownership are well pronounced in the results. Residing in North Italy increases the probability of holding shares by 0.023 while residing in South Italy and Islands decreases the probability of holding shares by 0.015. This striking difference may reflect the gap between North and South Italy in terms the development and sophistication of financial institutions. Overall, the results concur with the observation that in the South, the penetration of financial instruments is far less than that in the North especially for particular types of financial assets such as bonds, mutual funds and shares.

Among the occupational categories, the managers are the most likely shareholders, everything else held constant, with the highest marginal effect of 0.08 on the probability of share holding. Being a member of arts or professions increases the probability of share ownership by 0.072. Junior manager/cadre follows closely with a marginal effect of 0.069. These results are consistent with findings of Haliassos and Bertaut (1995) suggesting that the pronounced effect might be due to the nature of the managerial occupation. Informational considerations imply that having access to insider information is likely to contribute to a higher probability of holding shares. The likelihood of receiving shares as part of the compensation works in the same manner to produce the observed marginal effects. Another aspect of the implications of occupational categories for probability of share ownership is concerned with attitude towards risk. Households that are in occupations usually identified by less risk aversion are more likely to hold shares. Results of the probit estimation might partly reflect this consideration.

# 5   Conclusion

This paper studies the role of a number of demographic variables such as age, education, occupation, geographical area of residence as well as time in household decision to participate in asset markets. By studying the evidence on share holdings by Italian households, the paper attempts to shed light on the underlying causes of limited participation observed in many financial markets around the world. The results of the econometric analysis suggest that factors such as age, education, occupation and geographical area of residence are important in determining whether a household participates in asset markets or not.

Understanding factors, such as fixed costs, that still prevent a majority of the population from participating in asset market remains a challenge for future research. Both the theoretical and the empirical literature on limited market participation emphasize the existence of participation/transaction costs as a potential mechanism to deter a fraction of households from participating in asset markets. Depending on the particular economic environment assumed, these costs will generate limited market participation through different channels. A promising route to explore is how income or more specifically income risk affects household participation decision when such costs exist.

There are empirical studies that attempt to evaluate the implications of idiosyncratic income processes for market participation in various settings. For example, Polkovnichenko (2000) studies the implications of heterogeneous labor income and preferences for stock market participation. Vissing-Jørgensen (2002) investigates whether differences in nonfinancial income patterns across households in the existence of transactions costs can help explain household portfolio choice heterogeneity and hence stock market participation. However, a unified empirical framework is what is necessary to allow idiosyncratic income shocks motivated by the processes in the data interact with participation/transaction costs

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to generate limited market participation. The theoretical model developed by Alvarez, Atkeson and Kehoe (2002), where idiosyncratic income shocks are instrumental whether a household participates in asset markets or not when there is fixed cost for doing so, can provide a guide to construct such a framework. Such an empirical strategy is needed to help enrich our understanding of why participation in asset markets have been so limited.

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# A Appendix

The following is a list of dummies used in the probit estimation of share ownership decision:

**Educational qualification dummies**

e1: None/Elementary school

e2: Middle school (omitted dummy)

e3: High school

e4: Bachelor's degree

e5: Post-graduate qualification

**Occupational dummies**

q1: Blue-collar worker or similar (omitted dummy)

q2: Office worker or school teacher

q3: Junior manager/cadre

q4: Manager

Self-employed:

q5: Member of the arts or profession

q6: Sole proprietor, freelance and unpaid family member

q7: Not employed

**Dummies for geographical area of residence**

a1: North

a2: Central Italy (omitted dummy)

a3: South and Islands

# B  Tables

Table 1

Percentage of Shareholders by Age

| Age Group | Percentage |
|-----------|------------|
| ≤ 30      | 2.72       |
| 31-40     | 5.42       |
| 41-50     | 6.67       |
| 51-65     | 5.56       |
| ≥ 65      | 2.70       |

Table 2

Percentage of Shareholders by Education

| Educational Qualification   | Percentage |
|-----------------------------|------------|
| None                        | 0.27       |
| Elementary school           | 1.44       |
| Middle school               | 3.12       |
| High school                 | 9.03       |
| Bachelor's degree           | 16.42      |
| Post-graduate qualification | 17.09      |

Table 3

Percentage of Shareholders by Occupation

| Occupation | Percentage |
|---|---|
| Blue-collar worker/similar | 1.15 |
| Office worker/school teacher | 6.47 |
| Junior manager/cadre | 13.11 |
| Manager | 20.36 |
| Member of the arts and professions | 15.36 |
| Sole proprietor, freelance, unpaid family member | 6.85 |
| Not employed | 2.88 |

Table 4

Percentage of Shareholders by Geographical Area

| Area | Percentage |
|---|---|
| North | 8.02 |
| Center | 3.57 |
| South&Islands | 1.82 |

Table 5

Probit Estimation for Share Ownership

| Variable | Parameter | Standard Error | t-ratio | Marg. Effect |
|---|---|---|---|---|
| Age | .067 | .007 | 9.28 | .004 |
| $Age^2$ | -.001 | .000 | -7.99 | -.000 |
| None/Elementary | .001 | .211 | 0.01 | .000 |
| High school | .594 | .143 | 4.16 | .044 |
| Bachelor's degree | .608 | .170 | 3.59 | .055 |
| Post-graduate | 1.484 | .485 | 3.06 | .277 |
| Agexe1 | -.009 | .004 | -2.51 | -.000 |
| Agexe3 | -.003 | .003 | -1.15 | -.000 |
| Agexe4 | .003 | .003 | 0.85 | .000 |
| Agexe5 | -.015 | .010 | -1.49 | -.001 |
| Trend | .352 | .129 | 2.73 | .019 |
| $Trend^2$ | -1.163 | .362 | -3.21 | -.063 |
| $Trend^3$ | .569 | .183 | 3.10 | .031 |
| $Trend^4$ | -1.110 | .037 | -2.93 | -.006 |
| $Trend^5$ | .007 | .003 | 2.81 | .000 |
| AgexTrend | .000 | .002 | 0.14 | .000 |
| $AgexTrend^2$ | -.000 | .000 | -0.50 | -.000 |
| e1xTrend | .021 | .009 | 2.44 | .001 |
| e3xTrend | .000 | .007 | 0.03 | .000 |
| e4xTrend | -.003 | .008 | -0.39 | -.000 |
| e5xTrend | -.014 | .030 | -0.48 | -.001 |
| North | .393 | .033 | 12.07 | .023 |
| South&Islands | -.295 | .041 | -7.27 | -.015 |
| Office worker/school teacher | .417 | .055 | 7.57 | .030 |
| Junior manager/cadre | .691 | .066 | 10.46 | .069 |
| Manager | .747 | .076 | 9.87 | .080 |
| Member of the arts or professions | .706 | .067 | 10.59 | .072 |
| Sole proprietor/freelance/family member | .673 | .054 | 12.48 | .060 |
| Not employed | .283 | .057 | 4.94 | .016 |
| Constant | -4.346 | .218 | -19.89 | |
| Observations | 38,764 | | | |
| Pseudo $R^2$ | 0.1915 | | | |
| Log-likelihood | -6137.573 | | | |

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Table 6

Baseline Probit Estimation for Share Ownership

| Variable | Parameter | Standard Error | t-ratio | Marg. Effect |
|---|---|---|---|---|
| Age | .086 | .007 | 12.36 | .006 |
| Age$^2$ | -.001 | .000 | -11.17 | -.000 |
| None/Elementary | -.258 | .201 | -1.28 | -.017 |
| High school | .877 | .135 | 6.48 | .093 |
| Bachelor's degree | 1.143 | .158 | 7.24 | .178 |
| Post-graduate | 1.914 | .465 | 4.11 | .478 |
| Agexe1 | -.006 | .003 | -1.85 | -.000 |
| Agexe3 | -.007 | .003 | -2.76 | -.000 |
| Agexe4 | -.005 | .003 | -1.62 | -.000 |
| Agexe5 | -.020 | .010 | -2.06 | -.001 |
| Trend | .311 | .123 | 2.52 | .021 |
| Trend$^2$ | -1.090 | .348 | -3.13 | -.073 |
| Trend$^3$ | .536 | .176 | 3.05 | .036 |
| Trend$^4$ | -.103 | .036 | -2.89 | -.007 |
| Trend$^5$ | .007 | .003 | 2.77 | .000 |
| AgexTrend | .000 | .002 | 0.12 | .000 |
| AgexTrend$^2$ | -.000 | .000 | -0.39 | -.000 |
| e1xTrend | .024 | .008 | 2.87 | .002 |
| e3xTrend | .003 | .007 | 0.45 | .000 |
| e4xTrend | -.001 | .008 | -0.17 | -.000 |
| e5xTrend | -.012 | .029 | -0.40 | -.001 |
| Constant | -4.266 | .210 | -20.35 | |
| Observations | 38,764 | | | |
| Pseudo $R^2$ | 0.1369 | | | |
| Log-likelihood | -6551.957 | | | |