# Do personal factors affect an individual's expectations of the economy?

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**Abstract** – This paper uses consumer survey data from the University of Michigan Surveys of Consumers to examine the effect of personal and non-personal variables on consumers' expectations for future economic performance. The years 2011 to 2019 have been chosen for this analysis. Results indicate that both personal and non-personal variables have statistically significant explanatory power for consumer economic expectations. Expectation of personal finances for the following year has the strongest influence of the personal variables. It is also found that the marginal influences of some variables change depending on whether the change in the S&P500 index price is positive or negative.

Fluctuations in consumer sentiment can have causal effects on economic activity, and influence a country's macroeconomic performance. The notion that consumer beliefs play a role in an economy's future performance has been around since the development of modern economic theories. In 1936, John Maynard Keynes referred to this phenomena as "animal spirits", and posited that fluctuations in animal spirits can affect an economy's output both positively and negatively (Keynes, 1936). However, less research exists on the factors that attribute to this sentiment.

The University of Michigan's survey research center has conducted significant research on the matter of consumer sentiment. The Michigan Consumer Sentiment Index (MCSI) is one of two generally accepted measures of consumer sentiment in the United States, the other being the Conference Board Consumer Confidence Index (Dominitz & Manski, 2004). The MCSI is calculated using responses to five survey questions (Survey of Consumers). This study will focus on one of those constituents: expectation of economic performance over the next 12 months. The goal of the analyses presented in this paper is to investigate the effect of personal factors on an individual's expectation of economic performance. Theoretically, expectations should only be formed based on economic indicators and external factors, and not by the circumstances of one's personal life. However, based on additional research, I hypothesize that personal variables will have a non-zero effect on one's economic expectations. The critical personal variable in this study will be the individual's expectations of their financial performance in the following year. Additionally, I hypothesize that the critical economic indicator of this study, the performance of the S&P500 index, will also have a non-zero effect on one's economic expectations. The next section will provide research from other literature pertaining to the topic of consumer sentiment from which the general hypothesis was developed.

## ***I. Literature Review***

Katona (1971) outlined a behavioral model upon which the MCSI was initially constructed. The model that postulates that the "response (*R* – for example, changes in certain forms of consumer spending or saving) is not a function of the stimulus alone (*S*, consisting, for instance, of information received on changes in income, prices, supply conditions)" (Katona, 1971). Other "intervening variables (*I*)", such as "people's motives, attitudes, expectations, and aspirations" influence the changes in *R* along with their perception of *S* (Katona, 1971). The measure of consumer sentiment reflects this *I*. Therefore, changes in consumer economic behavior is dependent on changes in income, prices and supply conditions, as well as general sentiment toward the economy. This model provides the foundational theory to models developed in this paper. Katona's model uses *S* and *I* to explain changes in *R*, whereas the models presented in this paper will use constituents of *R* and *S* to explain changes in *I*. Specifically, *I* will be considered to be reflected in the expectation of economic performance over the following year. Therefore, the models presented in this paper will follow the theory that consumer expectations are dependent on expected changes in spending or savings, as well as changes in macro-economic variables. Although consumer sentiment is not the same as expectation, this theory assumes that expectations are often formed based on sentiment.

Dominitz and Manski (2004) explore how best to measure consumer confidence using the MCSI as the test subject. It was discovered in their research that the scores for questions about the macroeconomy had much larger variations than questions about personal finances. This could be a result of unawareness of economic performance or actual uncertainty in the economy (Dominitz & Manski, 2004). As a result of this difference in variation, Dominitz and Manski believe that fluctuations in the index is more strongly caused by the state of national business conditions than personal finances. Although Dominitz and Manski use the overall sentiment index score, which is measured at the aggregate level, the expectation of economic performance is one of its constituents and so this discovery will still be as relevant, if not more, to the analyses presented in this paper. Lastly, while Dominitz and Manski assess the measure of consumer confidence using only the variables and responses included in the original survey, this paper will extend its analyses by considering non-survey data that may also have an impact on consumer expectations such as unemployment levels, inflation and the S&P500 index performance.

One critical assumption made thus far is that consumers are well informed about the economy and its current state. However, that may not be the case. Curtin (2007) referred to a concept called

"rational inattention", which postulates that "rational consumers may find the costs associated with updating their information on the economy to exceed the benefits" (Curtin, 2007). Through a series of surveys, it was found that only a minority of respondents, when asked for the unemployment rate, GDP growth rate, and inflation rate, provided specific statistics (Curtin, 2007). The responses typically differed from the actual statistic by half a percentage point to one and a half percentage points, depending on the statistic (Curtin, 2007). If Curtin's findings are universal, and the respondents of the survey data that will be used in this paper also suffer from similar rational inattention, it could be harmful to the expected results of the models. Specifically, this may result in larger residuals for the macroeconomic control variables than if the participants did not suffer from rational inattention.

While this paper focuses on analyzing the variables that effect consumers' expectations about the economy's performance, it is necessary to keep in mind the importance that these expectations hold in an economy, and their impact on overall economic activity. Ludvigson (2004) investigates whether consumer confidence, can be used to forecast economic activity. Specifically, her research focuses on the ability of consumer confidence to forecast future consumption growth. This research has a similar focus to Katona's (1971) theory of human behavior, as it infers that spending habits are dependent on sentiment levels. The results presented in Ludvigson (2004) suggest that consumer sentiment has "modest incremental forecasting power" for total personal consumer expenditure growth (Ludvigson, 2004). However, other expenditure categories exhibit weaker relationships with consumer confidence. Nevertheless, Ludvigson's study helps emphasize the importance of consumer confidence in relation to the overall economy. Therefore, it is also important to study the factors that affect consumer confidence and expectations, which this paper aims to do.

## II. ***Development of the Testable Hypotheses***

The dependent variable in all the models developed in this section will be the BUS12r survey response (see **Table 0** for variable descriptions). The development of the models in this section was primarily influenced by the theory in Katona (1971) and the findings in Curtin (2007) pertaining to the concept of rational inattention. The dependent variable will represent the *I* in Katona's behavioral model. On an individual level, Katona's (1971) *R* variable can be reflected by an individual's expectation of their future financial wellbeing. The "personal financial" subset of variables in **Table 0** will be considered to represent this *R*. These variables are expected to have a positive marginal influence on the dependent variable. That is, with a positive outlook on an individual's future financial performance, their expectation of economic performance will also be positive. This can also be supported by Curtin's theory of rational inattention. If an individual has not updated their information about the macroeconomy, then the formulation of their expectation of economic performance will depend largely on their expectation of their own performance. The "personal non-financial" subset of variables in **Table 0** will be used as controls for personal circumstances in the models.

The "non-personal" subset of variables in **Table 0** will be representing Katona's (1971) *S*. The S&P500 percent change will be considered as the critical macroeconomic variable under the assumption that consumers generally accept the S&P500 to indicate the state of U.S. business conditions. As presented in Ludvigson (2004), consumer sentiment can have some forecasting ability for consumption growth and therefore economic performance. That is, positive consumer sentiments can predict and cause positive economic performance, and negative consumer sentiment can predict and cause the opposite. The theory in this paper postulates that this relationship is influential in both directions – economic performance can also influence consumer expectations in the same way. Therefore, the expected influence of the S&P500 variables on consumer expectations is positive. Other macroeconomic variables that are included in the models are also representative of Katona's (1971) *S*. These include the unemployment rate and inflation, which are both expected to have negative marginal influences on the dependent variable since an increase in either would suggest poor economic performance.

Models 1, 2 and 3 are included in **Table 2**. All models are linear in form. Model 1 includes all personal financial, personal non-financial and non-personal independent variables mentioned in **Table 0**. Model 2 expands on Model 1 by including two interaction terms (interaction of the S&P500 percent change and the unemployment rate percent change with dummy variables that indicate whether the

change in the variable is positive or negative). This model follows the notion that individuals might react differently when circumstances indicate positive and negative outcomes. Model 3 imposes restrictions on Model 2 by removing the personal non-financial variables from the model.

## III. *Data and Statistical Assumptions*

The dataset used includes 17503 observations (n=17503) of individual responses to survey questions ranging from July 2011 to August 2019. The cross-sectional survey data has been obtained from the MCSI database and has been merged with macroeconomic data taken from the FRED database that correspond to the time at which the survey data was collected. All categorical survey response data was recategorized to scale from -1 to 1 with 0.5 or 1 unit increments depending on the number of response options. The data corresponds to the variables proposed in the theory as described in section II. Relevant summary statistics for the final dataset can be seen in **Table 3**. Statistics to note include the means of the dependent variable and the personal financial independent variables, which indicate a generally positive outlook on the future. This is interesting as it suggests an emotional recovery of the American people in the decade following the Great Recession of 2007-2008.

## IV. *General Empirical Results*

The results of the models developed in section II are presented in **Table 4**. Based on the adjusted $R_2$ and AIC values, Model 2 seems to have the highest explanatory power. This would also make sense theoretically, since it takes into account all personal and non-personal variables, as well as interacts those variables whose marginal influence on the dependent variable might be effected by a positive or negative change. Moreover, it is important to note that Model 3, that restricts the personal non-financial variables, has the lowest $R_2$ and AIC values. This result suggests that these variables are important controls in the estimation of consumer expectations. **Table 5** presents Ramsey's RESET test for all models in **Table 4**. Since I reject the null hypotheses that all three subsets of variables are jointly insignificant[1], I must include that all models failed Ramsey's RESET test and therefore include misspecification errors. However, based on the underlying theory, I will continue to analyze the results of the estimations.

Upon further consideration, given that the SP_U is significant at the 1% level and so is it's interaction term, a Chow test on Model 2 seemed appropriate to test whether or not the marginal effects of some variables differed when the S&P500 price changed positively or negatively. These results can be seen in **Table 8**, and indicate that the marginal influences of the variables are significantly different at the 1% level. The results of the estimations for the separated data are presented in **Table 9**. Interestingly, the SP500_PCH does not have a significant marginal influence when there is a positive change in the index price, but is significant when there is a negative change. This supports the theory that individuals respond differently to negative and positive outcomes, and therefore supports the motivation behind including the interaction term of SP500_PCH and SP_U in the Model 2. Further examination of the results indicate that the marginal influences of other variables also change notably more than others[2]. Namely logSP500, UNRATE_UD, UNRATE_PCH, PEXP5r, PAGO5r, PCRYr, INEXQ1R and AGE[3].

As a result of these new findings during the examination of the empirical results, a Model 4 is constructed that includes new interaction terms with all of the afore mentioned variables and SP_U. The results of Model 4 can be seen in **Table 4**. The adjusted $R_2$ and AIC values for this model are both higher than models 1, 2, and 3. Therefore, this will be the final model developed in this paper and will be the focus of the analyses to come. **Table 7** presents the results for the Breusch-Pagan Godfrey (BPG) tests for heteroskedasticity and tests for multicollinearity. The results of the BPG test lead me to reject all three tests, which suggests the possibility of heteroskedasticity. However, the size of the dataset could explain the existence of heteroskedasticity, and therefore it does not raise much concern. Still, taking this into account, all standard errors reported in **Table 4** White standard errors and all significance levels are

[1] Subset F-tests were conducted for personal financial, personal non-financial and non-personal variables and indicate that the variables of each subset are jointly significant at the 1% level. These results can be seen in **Table 6**

[2] Relevant cross derivatives for these variables were not initially hypothesized and therefore are not included in **Table 1**

[3] Sex also had notably different marginal influences when the data is separated but was not interacted with SP_U in Model 4 because it does not make much theoretical sense as it is not a financial factor. Age was included, although it is not a financial factor, with the notion that older individuals may have increased stock market awareness.

heteroskedasticity consistent. Additionally, the variance inflation factors of some variables indicate that there is multicollinearity (VIF > 5). However, this is only the case for those variables with interaction terms, and is therefore not of much concern. Lastly, outliers were not tested for as they are not believed to be of much concern due to the size of the dataset used in this analysis.

The empirical results of Model 4 seem to align with the theory postulated by Katona (1971) that the consumer sentiment is dependent on income expectations, price changes and supply conditions. It is certainly evident that personal financial expectations are a significant in the formulation of one's expectation of the economy, since all variables that reflect future financial wellbeing are statistically significant at the 1% level. Moreover, the results also support the initial theory that external factors have a statistically significant effect on consumer expectations, which is also aligned with the findings by Dominitz and Manski (2004). This, in combination with the results of the Chow test, could also offer evidence to suggest that the consumers in this dataset do not suffer from the rational inattention presented in Curtin (2007). However, to determine whether non-personal factors are more influential that personal factors, as argued by Dominitz and Manski (2004), additional tests that are not conducted in this paper would be required.

## V. *Interpretation of the Empirical Results*

The results of Model 4, presented in **Table 4**, mostly align with the hypotheses developed in section II. Almost all signs for the variables' marginal influences were correctly predicted, with the exception of the S&P500 and unemployment rate change dummy variables. The results would indicate that a positive change in the S&P500 index price results in a negative marginal effect on an individual's expectation of economic performance. Additionally, it seems that an increase in the unemployment rate would result in a positive marginal effect on an individual's expectation of the economy. Both of these results seem to contradict the underlying theory used to hypothesize their signs in section II. Upon examination of the summary statistics presented in **Table 3**, the mean of the unemployment rate dummy variable favors 0, and the median of the variable is also 0. Moreover, the mean and median unemployment rate percent changes are negative. So it could be that the observations with decreases in the unemployment rate from the previous month far outnumber those with increases, thus hindering the estimation of the marginal influence of this variable. However, it is significant at the 1% level, so it cannot be ignored.

Even harder to explain is the SP_U marginal influence. The results indicate a negative marginal influence in individual expectation when there is a positive change in the S&P500. More shocking is the magnitude of the marginal influence when compared to the other statistically significant dummy variables. However, the magnitude is most likely the model compensating for the various interaction terms in Model 4 that include SP_U. The negative influence indicates that individuals expect the economy to perform worse following periods of positive performance. This could be due to lingering pessimism caused by the Great Recession, or perhaps credited to the belief that the market corrects itself after bullish periods. Either way, the sign of the marginal influence does not match that of what was hypothesized in section II. The marginal influence of the S&P500 index price and its monthly percent change, however, do align with the initial hypotheses made. According to the results, it would seem that a 1% increase in the average monthly price of the S&P500 index will cause a 1.2623 unit increase in an individual's BUS12r[4], on average and holding all else constant. Similarly, a 1 percentage point increase in the monthly percent change of the S&P500 price will result in a 0.01777 unit increase in the expectation of future economic performance, on average and holding all else constant.

The subset of personal variables seem to align with the hypotheses constructed in the beginning of the paper. It would seem that those response variables that indicate positive personal financial performance have a positive marginal influence on ones expectation of the economy. The critical personal variable, PEXPr, has the highest marginal influence out of all non-dummy response variables (measured on the same scale). To elaborate, on average and holding all else constant, a one unit increase in the

[4] All marginal influences stated in terms of BUS12r units indicate a change in the -1 to 1 scale of economic expectation (-1 being the worst negative expectation, and 1 being the best positive expectation).

expectation of personal financial performance in the following year results in a 0.09289, 0.08853 and 0.1534 larger increase in BUS12r than a one unit increase in PAGO5r, PCRYr and PEXP5r respectively (see **Table 0** for variable explanations). Interestingly, the AGE variable has a positive marginal influence on ones expectation of economic performance and is statistically significant at the 1% level. This would suggest that the older an individual is, the most optimistic they are about economic performance. To interpret this numerically, a one year increase in age results in a 0.0029 unit increase in ones expectation of economic performance. Contrastingly, education seems to have a negative marginal influence on economic expectation.

The added interaction terms (for definitions see **Table 0**) seem to have benefitted the explanatory power of the model as the adjusted $R_2$ and AIC have both improved compared to previous models. Perhaps the most notable term is the logSP_SPU, which interacts the (log of the) S&P500 price with the SP_U dummy variable. This interaction term is significant at the 1% level, and indicates that, on average and with all else held constant, the marginal effect of a 1% change in the price of the S&P500 on BUS12r increases by 0.21043 when there is a positive change in the index price from the previous month. Once again, this supports the notion to interact these two terms. Additionally, the interaction term between the UNRATE_UD and SP_U also produces an interesting result and is significant at the 5% level. The UNR_SPU estimate indicates that, on average and with all else help constant, the marginal effect of a positive change in the unemployment rate from the previous month on BUS12r is decreased by 0.1195 when there is a positive change in the S&P500 price from the previous month.

The results presented in this section seem to align with the behavioral theory in Katona (1971). Personal financial factors do have a positive marginal effect on economic expectation. Although the UNRATE_UD and SP_U dummy variables have the opposite effects than what was hypothesized using Katona's theory, the percent change variables for the S&P500 and unemployment rate are as hypothesized. These results also suggest evidence consumers do not suffer from the rational inattention as presented in Curtin (2007) since the signs of the coefficients of the SP500_PCH and the UNRATE_PCH are theoretically accurate and statistically significant.

## VI. ***Summary and Conclusions***

The results presented in this paper support the initial hypotheses. Both personal and non-personal variables are statistically significant in estimating individual expectation of economic performance. Individual opinion on personal finances one year from the present seems to be the most influential personal factor. Additionally, I am inclined to conclude that a positive or negative price change in the S&P500 index has a strong impact on consumer expectations, perhaps even more so than the value of the change itself. The signs of the SP_U and the UNRATE_UD variables are still cause for concern, and do not align with what was initially hypothesized. Some reasons as to why that might be the case was addressed in the previous section.

The results of this paper lead to the conclusion that the respondents of the survey data used in this analysis do not suffer from rational inattention. All economic non-personal variables in Model 4 were statistically significant at the 10% level, while most were significant at the 1% level, including inflation. However, the theory that only economic indicators influence economic expectations is evidently false. Therefore, Katona's (1971) behavioral theory was accurate. Individual expectation expectations of the economy are dependent on expected spending and savings, as well as national business conditions. The findings presented in this paper could provide some economic significance to behavioral economists and sentiment researchers. Additional testing would be required, such as a standard deviation t-test, to further investigate which of the two subsets (personal or non-personal) have a stronger marginal influence on individual economic expectations. As a final note, it is important to address that the median income of the respondents in the dataset used was higher than that of the national median[5]. Therefore, it would be difficult to translate these findings to the American population as a whole.

[5] Dataset median income is $100,000, while the national median income was about $63,000 as of 2018 (Federal Economic Reserve, n.d.). Dataset median income is not included in summary statistics, but it can be back calculated using the logINCOME.

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**Table 0: Variable descriptions**

| **Dependent Variable** | **Description** |
|---|---|
| BUS12r (categorical) | Individual opinion on economic performance for next 12 months (-1 to 1, 0.5 increments) |
| **Non-personal** | **Description** |
| logSP500 | Log of S&P500 Index price (monthly average) |
| logSP500_PCH (%) | Percent change in S&P500 price (already adjusted for inflation) from previous month |
| SP_U (dummy) | Whether the S&P500 price change was positive or negative (0,1) |
| UNRATE | Unemployment rate |
| UNRATE_PCH (%) | Percent change in unemployment rate from previous month |
| UNRATE_UD (dummy) | Whether the Unemployment rate change was positive or negative (0,1) |
| CPI | Consumer Price Index |
| **Personal (financial)** | **Description** |
| PEXPr (categorical) | Individual opinion on personal finances being better, same or worse next year (-1,0,1) |
| PAGO5r (categorical) | Individual opinion on personal finances are better, same or worse than 5 years ago (-1,0,1) |
| PCRYr (categorical) | Individual opinion on comfortable retirement compared to 5 years ago better same or worse (-1,0,1) |
| PEXP5r (categorical) | Individual opinion on personal finances being better, same or worse in 5 years (-1,0,1) |
| INEXQ2 (%) | Individual estimation of percentage increase in family income during the next 12 months |
| INEXQ1r (categorical) | Individual opinion if income will go up, down or remain unchanged (-1,0,1) |
| logINCOME (dollars) | Log of individual income |
| logINVAMT (dollars) | Log of total worth of current investments in the stock market |
| PINC2 (%) | Percent chance of individual income in the next 12 months being higher than the past 12 months |
| PSTK (%) | Percent chance that individual will increase investments in the next year |
| **Personal (non-financial)** | **Description** |
| EDUC_college (dummy) | Whether or not the individual has a college degree (0,1) |
| MARRYd (categorical) | Whether or not the individual is married (0,1) |
| SEXd (categorical) | Whether the individual is male or female (0=F, 1=M) |
| AGE (years) | Individual age |
| NUMKID (number) | Number of children in the household |
| **Interaction terms** | **Description** |
| SPudSP_ch | SP_PCH*SP_U |
| UNud_UNch | UNRATE_UD*UNRATE_PCH |
| logSP_SPU | logSP500*SP_U |
| UNR_SPU | UNRATE_UD*SP_U |
| UNRch_SPU | UNRATE_PCH*SP_U |
| PEXP5_SPU | PEXP5r*SP_U |
| INEX_SPU | INEXQ1r*SP_U |
| PAGO_SPU | PAGO5r*SP_U |
| PCRY_SPU | PCRY5r*SP_U |
| AGE_SPU | AGE*SP_U |

**Table 1: Derivative sign predictions**

| | ∂Y/∂X | Relevant Cross-Derivatives |
|---|---|---|
| **Non-personal** | | |
| logSP500 | + | |
| SP500_PCH (%) | + | $\partial_2$Y/(∂SP_U∂ SP500_PCH) = + |
| SP_U (dummy) | + | |
| UNRATE | - | |
| UNRATE_PCH (%) | - | $\partial_2$Y/(∂UNRATE_UD∂ UNRATE_PCH) = - |
| UNRATE_UD (dummy) | - | |
| CPI | - | |
| **Personal (financial)** | | |
| PEXPr (categorical) | + | |
| PAGO5r (categorical) | + | |
| PCRYr (categorical) | + | |
| PEXP5r (categorical) | + | |
| INEXQ2 (%) | + | |
| INEXQ1r (categorical) | + | |
| logINCOME (dollars) | c | |
| logINVAMT (dollars) | c | |
| PINC2 (%) | + | |
| PSTK (%) | + | |
| **Personal (non-financial)** | | |
| EDUC_college (dummy) | c | |
| MARRYd (categorical) | c | |
| SEXd (categorical) | c | |
| AGE (years) | c | |
| NUMKID (number) | c | |

**Table 2: Algebraic models**

| Model | Equation |
|---|---|
| **(1)** | BUS12r = ß$_0$ + ß$_1$logSP500 + ß$_2$SP_U + ß$_3$SP500_PCH + ß$_4$UNRATE + ß$_5$UNRATE_UD + ß$_6$UNRATE_PCH + ß$_7$CPI + ß$_8$PAGO5r + ß$_9$PCRYr + ß$_{10}$EDUC_college + ß$_{11}$MARRYd + ß$_{12}$SEXd + ß$_{13}$PEXP5r + ß$_{14}$INEXQ2 + ß$_{15}$INEXQ1r + ß$_{16}$logINCOME + ß$_{17}$logINVAMT + ß$_{18}$AGE + ß$_{19}$NUMKID + ß$_{20}$PINC2 + ß$_{21}$PSTK + ß$_{22}$PEXPr |
| **(2)** | BUS12r = ß$_0$ + ß$_1$logSP500 + ß$_2$SP_U + ß$_3$SP500_PCH + ß$_{23}$SP500_PCH*SP_U + ß$_4$UNRATE + ß$_5$UNRATE_UD + ß$_6$UNRATE_PCH + ß$_{24}$UNRATE_PCH*UNRATE_UD + ß$_7$CPI + ß$_8$PAGO5r + ß$_9$PCRYr + ß$_{10}$EDUC_college + ß$_{11}$MARRYd + ß$_{12}$SEXd + ß$_{13}$PEXP5r + ß$_{14}$INEXQ2 + ß$_{15}$INEXQ1r + ß$_{16}$logINCOME + ß$_{17}$logINVAMT + ß$_{18}$AGE + ß$_{19}$NUMKID + ß$_{20}$PINC2 + ß$_{21}$PSTK + ß$_{22}$PEXPr |
| **(3)** | BUS12r = ß$_0$ + ß$_1$logSP500 + ß$_2$SP_U + ß$_3$SP500_PCH + ß$_{23}$SP500_PCH*SP_U + ß$_4$UNRATE + ß$_5$UNRATE_UD + ß$_6$UNRATE_PCH + ß$_{24}$UNRATE_PCH*UNRATE_UD + ß$_7$CPI + ß$_8$PAGO5r + ß$_{13}$PEXP5r + ß$_{14}$INEXQ2 + ß$_{15}$INEXQ1r + ß$_{16}$logINCOME + ß$_{17}$logINVAMT + ß$_{20}$PINC2 + ß$_{21}$PSTK + ß$_{22}$PEXPr |
| **(4)** | BUS12r = ß$_0$ + ß$_1$logSP500 + ß$_2$SP_U + ß$_3$SP500_PCH + ß$_{23}$SP500_PCH*SP_U + ß$_4$UNRATE + ß$_5$UNRATE_UD + ß$_6$UNRATE_PCH + ß$_{24}$UNRATE_PCH*UNRATE_UD + ß$_7$CPI + ß$_8$PAGO5r + ß$_9$PCRYr + ß$_{10}$EDUC_college + ß$_{11}$MARRYd + ß$_{12}$SEXd + ß$_{13}$PEXP5r + ß$_{14}$INEXQ2 + ß$_{15}$INEXQ1r + ß$_{16}$logINCOME + ß$_{17}$logINVAMT + ß$_{18}$AGE + ß$_{19}$NUMKID + ß$_{20}$PINC2 + ß$_{21}$PSTK + ß$_{22}$PEXPr + ß$_{25}$logSP500*SP_U + ß$_{26}$UNRATE_UD*SP_U + ß$_{27}$UNRATE_PCH*SP_U + ß$_{28}$PEXP5r*SP_U + ß$_{29}$PEXP5r*SP_U + ß$_{30}$INEXQ1r*SP_U + ß$_{31}$PAGO5r*SP_U + ß$_{32}$PCRYr*SP_U |

**Table 3: Summary statistics**

| Variable | N | Mean | Std Error | Minimum | Lower Quartile | Median | Upper Quartile | Maximum |
|---|---|---|---|---|---|---|---|---|
| **BUS12r** | 17503 | 0.176941 | 0.007205 | -1 | -1 | 1 | 1 | 1 |
| **logSP500** | 17503 | 6.761646 | 0.001649 | 6.248778 | 6.653774 | 6.780953 | 6.957927 | 7.062836 |
| **SP_U** | 17503 | 0.638233 | 0.003632 | 0 | 0 | 1 | 1 | 1 |
| **SP500_PCH** | 17503 | 0.670749 | 0.019854 | -10.8014 | -0.80313 | 1.23701 | 2.26701 | 6.11153 |
| **UNRATE** | 17503 | 5.469868 | 0.012286 | 3.3 | 4.1 | 5 | 6.8 | 9.3 |
| **UNRATE_UD** | 17503 | 0.307719 | 0.003489 | 0 | 0 | 0 | 1 | 1 |
| **UNRATE_PCH** | 17503 | -0.5843 | 0.050883 | -15.3846 | -4.87805 | -1.96078 | 2.5974 | 18.91892 |
| **CPI** | 17503 | 240.9055 | 0.064815 | 225.672 | 233.916 | 238.654 | 247.867 | 256.571 |
| **PEXPr** | 17503 | 0.325544 | 0.004957 | -1 | 0 | 0 | 1 | 1 |
| **PAGO5r** | 17503 | 0.407473 | 0.006618 | -1 | -1 | 1 | 1 | 1 |
| **PCRYr** | 17503 | 0.054162 | 0.005868 | -1 | -1 | 0 | 1 | 1 |
| **EDUC_college** | 17503 | 0.620294 | 0.003668 | 0 | 0 | 1 | 1 | 1 |
| **MARRYd** | 17503 | 0.726104 | 0.003371 | 0 | 0 | 1 | 1 | 1 |
| **SEXd** | 17503 | 0.628921 | 0.003652 | 0 | 0 | 1 | 1 | 1 |
| **PEXP5r** | 17503 | 0.456836 | 0.005444 | -1 | 0 | 1 | 1 | 1 |
| **INEXQ2** | 17503 | 10.24996 | 0.116604 | 1 | 3 | 5 | 10 | 95 |
| **INEXQ1r** | 17503 | 0.593784 | 0.006082 | -1 | 1 | 1 | 1 | 1 |
| **logINCOME** | 17503 | 11.48838 | 0.005253 | 8.476371 | 11.08214 | 11.51293 | 11.91839 | 13.12236 |
| **logINVAMT** | 17503 | 11.61064 | 0.013024 | 6.907755 | 10.59663 | 11.73607 | 12.89922 | 16.1181 |
| **AGE** | 17503 | 50.14272 | 0.114681 | 18 | 38 | 51 | 62 | 97 |
| **NUMKID** | 17503 | 0.621208 | 0.0078 | 0 | 0 | 0 | 1 | 5 |
| **PINC2** | 17503 | 64.79495 | 0.457535 | 0 | 30 | 75 | 90 | 999 |
| **PSTK** | 17503 | 65.57025 | 0.594473 | 0 | 50 | 65 | 80 | 999 |

**Table 4: Results for Models 1, 2, 3 and 4**

| *Variable* | *(1)* | | *(2)* | | *(3)* | | *(4)* | |
|---|---|---|---|---|---|---|---|---|
| *Intercept* | -4.50674*** | (0.85917) | -4.42221*** | (0.8618) | -4.8303*** | (0.86678) | -3.7616*** | (0.89075) |
| *logSP500* | 1.41485*** | (0.14241) | 1.37118*** | (0.14325) | 1.48196*** | (0.14411) | 1.2623*** | (0.14749) |
| *SP_U* | -0.06629*** | (0.02151) | -0.05596** | (0.02219) | -0.05382** | (0.02242) | -1.51616*** | (0.45143) |
| *SP500_PCH* | 0.00898** | (0.00396) | 0.0158*** | (0.00495) | 0.01551*** | (0.00499) | 0.01777*** | (0.00509) |
| *SPudSP_ch* | - | - | -0.0172** | (0.00819) | -0.01798** | (0.00825) | -0.01942** | (0.00823) |
| *UNRATE* | 0.02436 | (0.01534) | 0.0235 | (0.01534) | 0.02301 | (0.01544) | 0.02824* | (0.01538) |
| *UNRATE_UD* | 0.11027*** | (0.02372) | 0.1102 | (0.02426) | 0.11238*** | (0.02444) | 0.19039*** | (0.04207) |
| *UNRATE_PCH* | -0.00565*** | (0.00166) | -0.00533*** | (0.00167) | -0.00547*** | (0.00168) | -0.0078** | (0.00338) |
| *UNud_UNch* | - | - | -0.00119 | (0.00168) | -0.00113 | (0.0017) | -0.00169 | (0.00175) |
| *CPI* | -0.02302*** | (0.00232) | -0.02204*** | (0.00236) | -0.02285*** | (0.00237) | -0.02174*** | (0.00239) |
| *PEXPr* | 0.24842*** | (0.01277) | 0.24844*** | (0.01277) | 0.27506*** | (0.01274) | 0.24799*** | (0.01276) |
| *PAGO5r* | 0.14162*** | (0.00887) | 0.14174*** | (0.00887) | 0.17046*** | (0.00852) | 0.1551*** | (0.01469) |
| *PCRYr* | 0.14367*** | (0.00992) | 0.14356*** | (0.00992) | - | - | 0.15946*** | (0.01619) |
| *EDUC_college* | -0.05553*** | (0.01396) | -0.05558*** | (0.01396) | - | - | -0.05647*** | (0.01395) |
| *MARRYd* | -0.01374 | (0.01609) | -0.01394 | (0.01609) | - | - | -0.01519 | (0.01608) |
| *SEXd* | 0.08092*** | (0.01394) | 0.08088*** | (0.01394) | - | - | 0.08098*** | (0.01393) |
| *PEXP5r* | 0.11702*** | (0.01183) | 0.11687*** | (0.01183) | 0.11245*** | (0.01158) | 0.09459*** | (0.01802) |
| *INEXQ2* | -0.00045 | (0.0004541) | -0.00045 | (0.00045423) | -0.00093** | (0.00045463) | -0.00046 | (0.00045399) |
| *INEXQ1r* | 0.11922*** | (0.00989) | 0.11913*** | (0.00989) | 0.11612*** | (0.00994) | 0.13967*** | (0.01554) |
| *logINCOME* | -0.02402** | (0.01246) | -0.02386** | (0.01246) | -0.04524*** | (0.01148) | -0.0233** | (0.01246) |
| *logINVAMT* | 0.02486*** | (0.00509) | 0.02478*** | (0.00509) | 0.05083*** | (0.00447) | 0.02478*** | (0.00509) |
| *AGE* | 0.00397*** | (0.0005563) | 0.00398*** | (0.00055625) | - | - | 0.0029*** | (0.00082879) |
| *NUMKID* | 0.00135 | (0.00688) | 0.00139 | (0.00688) | - | - | 0.00148 | (0.00688) |
| *PINC2* | 0.000171 | (0.00010979) | 0.000174 | (0.00010984) | 0.000164 | (0.00010849) | 0.000174 | (0.00010963) |
| *PSTK* | 0.000471*** | (0.00009817) | 0.000468*** | (0.00009815) | 0.000491*** | (0.00010048) | 0.000462*** | (0.0000981) |
| *logSP_SPU* | - | - | - | - | - | - | 0.21043*** | (0.0663) |
| *UNR_SPU* | - | - | - | - | - | - | -0.1195** | (0.05043) |
| *UNRch_SPU* | - | - | - | - | - | - | 0.00345 | (0.00389) |
| *PEXP5_SPU* | - | - | - | - | - | - | 0.036* | (0.02164) |
| *INEX_SPU* | - | - | - | - | - | - | -0.03278* | (0.01903) |
| *PAGO_SPU* | - | - | - | - | - | - | -0.02077 | (0.01818) |
| *PCRY_SPU* | - | - | - | - | - | - | -0.0257 | (0.0201) |
| *AGE_SPU* | - | - | - | - | - | - | 0.00169* | (0.00096424) |
| $R_2$ | 0.2015 | | 0.2017 | | 0.1852 | | 0.2030 | |
| *Adj.* $R_2$ | 0.2005 | | 0.2006 | | 0.1844 | | 0.2015 | |
| *AIC* | -0.31838 | | -0.31839 | | -0.29864 | | -0.31913 | |
| *N* | 17503 | | 17503 | | 17503 | | 17503 | |

**Table 5: Ramsey's RESET test**

$H_0$: $ß_{SP\_U=1}=ß_{SP\_U=0}$
$H_A$: otherwise

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| **Power** | **RESET** | **Pr > F** | **RESET** | **Pr > F** | **RESET** | **Pr > F** | **RESET** | **Pr > F** |
| **2** | 3.8557 | 0.0496 | 3.5045 | 0.0612 | 4.3611 | 0.0368 | 3.0949 | 0.0786 |
| **3** | 19.1993 | <.0001 | 19.3328 | <.0001 | 25.6221 | <.0001 | 20.3594 | <.0001 |
| **4** | 12.8834 | <.0001 | 12.9691 | <.0001 | 17.4179 | <.0001 | 13.622 | <.0001 |
| **Conclusion** | Reject $H_0$ | | Reject $H_0$ | | Reject $H_0$ | | Reject $H_0$ | |

**Table 6: Model 2**

$H_0$: ($ß_{SP\_U=1}=ß_{SP\_U=0}$)
$H_A$: otherwise

| **Subset** | **F-value** | **Pr > F** | **Conclusion** |
|---|---|---|---|
| **Personal (non-financial)** | 22.07 | <.0001 | Reject null hypothesis ($\alpha = 0.01$) |
| **Personal (financial)** | 233.4 | <.0001 | Reject null hypothesis ($\alpha = 0.01$) |
| **Non-personal (economic)** | 31.18 | <.0001 | Reject null hypothesis ($\alpha = 0.01$) |

**Table 7:**

BPG $H_0$: $\sigma_{2i} = \sigma_2$
BPG $H_A$: otherwise

| | **BPG** | **Multicollinearity** |
|---|---|---|
| **Test Statistic Comparison** | 1) 26.2545 > 3.84<br>2) 1125.4429 > 3.84<br>3) 1125.4429 > 3.84 | VIF > 5 for ineracted variables |
| **Conclusion** | Reject $H_0$ | Multicollinearity exists |

**Table 8:**

$H_0$: $ß_{SP\_U=1}=ß_{SP\_U=0}$
$H_A$: otherwise

| | **Chow Test** |
|---|---|
| **Test Statistic Comparison** | 2.141729 > 1.811435 |
| **Conclusions** | Reject $H_0$ |

**Table 9: Model 2 results using split data (by SP_U = 0 and SP_U = 1)**

| *Variable* | *Model 2 (SP_U=1)* | | *Model 2 (SP_U=0)* | |
|---|---|---|---|---|
| *Intercept* | -5.52201*** | (1.14096) | -3.48926*** | (1.33035) |
| *logSP500* | 1.52545*** | (0.19688) | 1.12042*** | (0.22285) |
| *SP500_PCH* | -0.00216 | (0.00659) | 0.01996*** | (0.00547) |
| *UNRATE* | 0.03255 | (0.02007) | 0.02257 | (0.02419) |
| *UNRATE_UD* | 0.07324** | (0.02987) | 0.15978*** | (0.04883) |
| *UNRATE_PCH* | -0.00433** | (0.00198) | -0.00518 | (0.00395) |
| *UNud_UNch* | -0.00248 | (0.00212) | 0.00197 | (0.00373) |
| *CPI* | -0.02218*** | (0.00317) | -0.01897*** | (0.00424) |
| *PEXPr* | 0.24545*** | (0.01597) | 0.25198*** | (0.02121) |
| *PAGO5r* | 0.13567*** | (0.01105) | 0.15333*** | (0.01485) |
| *PCRYr* | 0.13402*** | (0.01244) | 0.15854*** | (0.01645) |
| *EDUC_college* | -0.06939*** | (0.01742) | -0.03388 | (0.0233) |
| *MARRYd* | -0.01295 | (0.02022) | -0.0201 | (0.02655) |
| *SEXd* | 0.09468*** | (0.01758) | 0.05766** | (0.02285) |
| *PEXP5r* | 0.13029*** | (0.01493) | 0.09541*** | (0.01938) |
| *INEXQ2* | -0.00021 | (0.00057992) | -0.00089 | (0.00073026) |
| *INEXQ1r* | 0.10844*** | (0.01246) | 0.13647*** | (0.01624) |
| *logINCOME* | -0.02649* | (0.01579) | -0.01764 | (0.02025) |
| *logINVAMT* | 0.02401*** | (0.00645) | 0.02637*** | (0.0083) |
| *AGE* | 0.00481*** | (0.00069832) | 0.0025*** | (0.00092004) |
| *NUMKID* | 0.00912 | (0.00868) | -0.0111 | (0.01126) |
| *PINC2* | 0.000157 | (0.0001435) | 0.000202 | (0.00016737) |
| *PSTK* | 0.000461*** | (0.00012445) | 0.000469*** | (0.0001592) |
| $R_2$ | 0.1967 | | 0.2152 | |
| *Adj.* $R_2$ | 0.1951 | | 0.2124 | |
| *N* | 11171 | | 6632 | |