DO BUSINESS CYCLE REGIMES MATTER IN FINANCIAL PORTFOLIO CHOICE?

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ABSTRACT

This study investigates whether business cycle regimes explain financial portfolio decisions across investors and countries given certain idiosyncratic characteristics. The paper studies the relationship between risky asset shares and linear and nonlinear business cycles, spanning the period 1998-2012. The analysis provides evidence that a nonlinear business cycles context leads investors to decrease their risky investments stronger during recessions than they increase them during booms. The results are expected to signal interesting flashing points not only to market participants and portfolio managers, but mainly to policy makers and the way their economic policy decisions affect the working of financial markets.

Keywords: Financial Portfolio Choice; Business Cycles; Household Surveys; Demographic Characteristics.

JEL Classification: G11; E32.

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I. INTRODUCTION

Over the past several years, there has been increased interest in portfolio choice across different types of households. It is generally evident that portfolios differ by wealth, the country in which the households and investors live, and a number of other idiosyncratic characteristics, such as education. The majority of households appear to maintain very simple portfolios, with fewer than 5 assets or accounts, despite the substantial proliferation of asset types available over the last 20 years (Bertaut and Starr-McCluer, 2002). According to the portfolio choice approach, the more risk-averse a household is, the lower the degree of risk in its portfolio (Chiappori et al., 2013). According to the standard portfolio choice approach, a large fraction of the population (in both developed and emerging capital markets) does not invest in risky assets, such as stocks. The reason for this is that increased participation in risky assets adds more responsibility to households, who must decide how to invest and diversify their wealth. Given the high-risk premium earned by investors in riskier assets in the long run, the problem of allocating wealth between risky and safe assets is crucial to investors' and consumers' future standard of living. It is also potentially one of the most complex financial decisions they must make. Investors must ask themselves how much risk they are willing to take, which requires an accurate appraisal of their own risk tolerance in a complex stochastic environment.

In the business cycle literature, many empirical works confirm the different characteristics of the business cycle across regimes. A large number of papers stress that such differentiated behavior leads to nonlinear behavior in the observed variables (Skalin and Teräsvirta, 2002; Cancelo and Mourelle, 2005; Cancelo, 2007). Therefore, we must resort to models capable of capturing the nonlinear pattern of the cycle, wherein phases of negative evolution of the variable are generally deeper, but shorter, than those of positive behavior. These dynamics clearly suggest that the motion of economic activity differs for non-recessionary and recessionary phases (Teräsvirta and Anderson, 1992; Zarnowitz, 1992; Granger et al., 1993; Peel and Speight, 2000). From the viewpoint of dynamics, cyclical differentiated patterns across business cycle regimes might arise when the propagation mechanism is based on intertemporal substitution of the labor supply when an adverse technological shock shifts the economy, as in real business cycle models.

Given that previous empirical work documenting the role of business cycle differentiation patterns across business cycle regimes in financial portfolio decisions is quite sparse, our goal is to analyze the impact of business cycle regimes on financial portfolio decisions in a nonlinear context. Although our initial intent was to also consider other types of assets, such as real estate and private business assets, we focus only on financial portfolios given the non-availability of data in the majority of the countries in our sample.

Our empirical analysis considers a panel of 13 countries after controlling for a number of demographic and economic idiosyncratic characteristics related to households. The empirical strategy consists of analyzing the relationship between the share of investments in risky assets, business cycles, and the characteristics of investors, both in a linear and in a nonlinear context. The share invested in risky funds is a good and simple measure of the riskiness of a portfolio allocation and has frequently been taken as the dependent variable in the literature on individual portfolio behavior (Papke, 1998).

The Global Financial Crisis reveals not only regulatory failure in financial markets and the need for stronger microprudential policies, but also the need for sufficient macroprudential policies aimed at increasing the stability of the financial sector as a whole. Therefore, the role of both central banks and fiscal authorities in determining the course of the economy is critical. Given that our (nonlinear) findings signify the presence of a statistically significant link between business cycle characteristics and portfolio decisions, the role of economic policymakers in overcoming economic slumps and in reviving a sustainable long-term growth path in their economies is increasingly critical for the sustainability of financial markets along with the growth process.

This paper proceeds as follows. Section II reviews the literature. Section III describes the data. Section IV presents our empirical analysis. Section V carries out the robustness tests. Finally, Section VI sets forth our conclusions.

II. LITERATURE REVIEW

A number of studies document that the features of investor behavior change in times of crisis (Alan et al., 2012; Banks et al., 2013; Crossley et al., 2013). In particular, Crossley et al. (2013) analyze trends in household saving behavior in the U.K. across three recessions, and their results reveal that the savings ratio rises when the economy goes into recession. Alan et al. (2012) argue that savings increases are justified by the rise in uncertainty associated with future income, the contraction of credit supply, and crashes in the prices of risky assets. Hoffman et al. (2013) also attempt to study investor perceptions and behavior during the Global Financial Crisis for the case of the Netherlands. These authors find that investor risk perception fluctuates significantly during crisis periods, while investors continue to trade and do not de-risk their investment portfolios during crises but use depressed asset prices as a signal to purchase more stocks. Necker and Ziegelmeyer (2013) analyze risk attitudes for German households and emphasize that an event that generates wealth shocks, such as the recent Global Financial Crisis, seems to affect risk taking. In the same direction, Weber et al. (2013) find that risk attitudes are fairly stable, but there are substantial changes in risk-taking over time. The cause of these changes is related to changes in subjective feelings about future market risks and returns as a result of recent (crisis) events. However, this strand of the literature does not consider the effect of the macroeconomic environment on investor decisions. The present paper explicitly brings this environment into the investment process.

In line with the argument that future income uncertainty could influence household savings behavior, Amromin and Sharpe (2009) examine the stock market beliefs of investors and find that the more optimistic are macroeconomic conditions for the coming years, the higher are expected returns and the lower is the investor's risk perception. Lynch and Tan (2011) find that the predictability of labor income growth plays an important role in a young agent's decision-making on portfolio stock holdings. Banks et al. (2013) analyze the responses of older households (people just retired or approaching retirement) in the U.K.

during crisis periods. These authors show that the distribution of occurred losses varies across households due to variations in wealth. Additionally, Nofsiger (2012) analyzes household behavior during boom and bust cycles in stock markets. This author provides evidence that households tend to allocate their portfolios towards risky assets, even through the use of financial leverage during booms, and they tend to sell assets at low prices to repay their debts or save more during market busts. Bucciol and Miniaci (2013) use a panel dataset from the Dutch Household Survey and consider six measures of self-assessed risk aversion to identify changes in individual risk aversion during changing economic conditions. These authors find that the perception of past risk exposure and transitions in the perception from high to low risk exposure are correlated with risk aversion. This strand of the literature, however, fails to capture nonlinear business cycle characteristics and uses a linear type of modeling to identify this impact on portfolio decisions. By contrast, our empirical analysis makes use of a nonlinear regime to generate evidence on this effect.

It is well established in the literature that risk attitudes vary by gender. A meta-analysis of 150 studies conducted by Byrnes et al. (1999) reports that women are consistently more risk averse in all sorts of contexts. Differences in risk tolerance by gender are particularly visible in financial choices. Barber and Odean (2001) exploit account data from a large discount brokerage and document that women hold less risky positions on average than men within their common stock portfolios. Arrondel et al. (2010) find evidence in favor of the impact of gender on investing in risky assets, with women investing less in stocks than men.

III. DATA

Data on consumer choices across households are obtained from the Janus Capital Group European Survey of Consumer Finances for the U.K., France, Germany, the Netherlands, Sweden, Norway, Denmark, Switzerland, and Italy, and from the Statistics Bureau of Japan for Japan, the National Household Surveys for Canada, the Household Income and Labor Dynamics in Australia (HILDA) for Australia, and the Household Economic Surveys in New Zealand, spanning the period 1998–2012. Although the U.S. has available data of the highest quality in consumer finance, it is not included in this analysis given the number of studies related to portfolio choice issues.

These surveys provide information about the structure of household characteristics and investment decisions. Each survey tracks a different number of households. After filtering for missing or confusing data, the surveys tracked 4,369 households for the U.K., 3,595 households for France, 3,765 for Germany, 2,780 for the Netherlands, 2,230 for Sweden, 2,450 for Norway, 2,900 for Denmark, 2,420 for Switzerland, 2,370 for Italy, 5,439 for Japan, 4,350 for Canada, 3,760 for Australia, and 2,374 for New Zealand. Total observations is the product of the number of individual investors times the number of years. In these panels, data on portfolio shares are collected on an annual basis.

Assets are classified according to their degree of riskiness. In particular and for the sake of empirical analysis, assets are classified as "risky" or "safe," In our analysis, the category of safe assets includes checking accounts, savings accounts, money market accounts, certificates of deposit, cash value of life insurance, government bonds, mutual funds invested in tax-free bonds, mutual funds invested in government-backed bonds, trusts and annuities invested in bonds, money market accounts, life insurance, and pension plans. In contrast, the category of risky assets includes stocks and brokerage accounts, mortgage-backed bonds, foreign bonds, corporate bonds, mutual funds invested in stock funds, trusts and annuities invested in stocks or real estate, and pension plans characterized as thrift, profit-sharing, or stock purchases. Given the structure of the risky asset portfolio, information about indirect exposure to these financial assets through labor market pension schemes is also included. Based on this classification, we obtain the percentage of risky asset holdings (i.e., out of total financial assets) as the dependent variable in our model. In addition, both safe and risky accounts include holdings of not only domestic but also foreign assets, while we focus only on investors who hold both safe and risky assets in their financial portfolios.

Households are grouped by education level, gender, marital status, and number of children. In particular, education levels are defined as high school graduates = 0 and college graduates = 1; gender is defined as male = 1 and female = 0; marital status is defined as single = 1 and married = 0; and number of children is defined as zero children = 0 and 1-3 children = 1. Later in the empirical analysis, the reported coefficients are those related to the dummy definitions that involve the units as described above.

When the household is married, the reported income and asset information refer to the combined values of the household and spouse. The asset and income data are expressed in 1998 exchange rate dollars. To limit the influence of outliers, we omit the top and bottom 1% of households in terms of income.

In addition, seasonally adjusted real GDP data are obtained for the same period. To decompose the GDP information into its trend and cycle components, we use the methodology recommended by Harvey and Trimbur (2003), who present a general class of model-based filters for extracting trends and cycles in macroeconomic time series, showing that the design of low-pass and band-pass filters can be considered a signal extraction problem in an unobserved components framework.

IV. EMPIRICAL ANALYSIS

Our econometric methodology follows both a linear and a nonlinear approach to determine the impact of business cycles on portfolio choices. Furthermore, preliminary empirical testing illustrates that the variables of risky shares, total income, and total assets are stationary across countries. In that sense, their levels are used throughout this analysis (results are available upon request).

A. The Linear Case

Econometric estimation uses a fixed effects maximum likelihood panel estimation to examine the impact of asset type on portfolio choices, given a number of demographic and economic variables. In particular, the model is given in equation (1) as follows:

$$risky\ share_{it} = aX_{it} + b_1 assets_{it} + b_2 yc_{t-1} + c_i + u_{it} \quad (1)$$

where the dependent variable is the percentage of risky asset holdings and $i = 1, \ldots, N$ for each household in the panel, $j = 1, \ldots, M$ for each country in the sample, and $t = 1, \ldots, T$ refers to the time period. X denotes a vector of demographic control variables, such as education, gender, marital status, and number of children. *Assets* describe total assets, while yc is the cyclical component of GDP. The parameter c_i allows for the possibility of fixed effects. The error term u captures other sources of heterogeneity (i.e., not considered here) in portfolios, such as entrepreneurial risk (Heaton and Lucas, 2000), investment mistakes (Calvet et al., 2007), heterogeneity in risk aversion, and measurement errors (especially in income-see Cocco, 2005). Given that these other sources could be correlated with assets, the model must satisfy the variation in assets that is orthogonal to the set of control variables. The methodology of fixed effects estimation is followed based on the Hausman (1978) test, which is based on a vector of estimated coefficients and variance–covariance matrices obtained from several estimation methods.

The results are reported in Table 1. The signs of the control variables are as expected and the coefficients are statistically significant. By focusing on the coefficient of the cyclical component of income, the estimates across all countries document that although there exists a positive association between risky financial investments and the cyclical component of output, these empirical findings are statistically insignificant. In terms of the control variables, the empirical findings reveal that investors who are male, have a college degree, and are relatively high on the income distribution tend to exert a positive and significant impact on the likelihood of increasing their share of risky investments across countries. In contrast, if they are married and have children, they tend to reduce their share of risky investments, again, across countries. The above findings confirm the significance of the demographic variables in the framework of portfolio choice and are consistent with the results reached by Dohmen et al. (2011), who make use of an experimental approach and show that a number of demographic variables have an impact on willingness to take risk. Finally, diagnostic testing across the estimates of all countries confirms that the model is characterized by the absence of serial correlation and misspecification problems. The results also conform with application of the Hausman fixed test. Comparing the probability value at the significance level of 1%, the null hypothesis is accepted, and consequently the fixed effects method is valid. However, Wald statistics on the tested hypothesis between a linear model and a two-regime nonlinear model are computed (i.e., the maximum Wald (sup-Wald) statistic; the average Wald (avg-Wald) statistic; and the sum of exponential Wald (exp-Wald) statistic) (Hansen, 1996). The results reveal that we can reject the null hypothesis and present strong evidence of the presence of a nonlinear (two-regime) model for real GDP growth.

Table 1.
Panel Linear Estimations

The table presents the panel linear estimates of the model, *risky share*$_{it}$ = $a\ X_{it} + \beta_1\ assets_{it} + \beta_2\ yc_{t-1} + \alpha_i + u_{it}$ where the dependent variable is the percentage of risky asset holdings, $i = 1, \ldots, N$ for each household in the panel, while $t = 1, \ldots, T$ refers to the time period. X denotes a vector of the demographic control variables, such as education, gender, marital status and the number of children. Assets describe total assets, while yc is the cyclical component of GDP. The parameter α_i allows for the possibility of fixed effects. Figures in brackets denote *p*-values. LM is a serial correlation test, RESET is a misspecification test, while Sub-Wald, Avg-Wald and Exp-Wald are Wald statistics evaluating the significance of a two-regime non-linear model against the linear model.

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
Constant	0.784 [0.00]	0.952 [0.00]	0.641 [0.00]	1.006 [0.00]	0.795 [0.00]	0.472 [0.00]	0.463 [0.00]
Assets	1.835 [0.00]	1.569 [0.01]	1.242 [0.00]	1.69 [0.00]	1.725 [0.00]	1.646 [0.01]	1.524 [0.02]
yc(-1)	0.274 [0.36]	0.236 [0.28]	0.182 [0.26]	0.298 [0.30]	0.254 [0.19]	0.187 [0.31]	0.169 [0.22]
Male	0.054 [0.01]	0.041 [0.02]	0.029 [0.01]	0.053 [0.01]	0.046 [0.01]	0.062 [0.00]	0.048 [0.00]
Marital Status	-0.068 [0.02]	-0.034 [0.00]	-0.016 [0.00]	-0.048 [0.02]	-0.026 [0.00]	-0.061 [0.01]	-0.045 [0.01]
Education	-0.041 [0.00]	-0.028 [0.02]	-0.019 [0.01]	-0.035 [0.01]	-0.028 [0.02]	-0.053 [0.00]	-0.036 [0.00]
Number of Children	-0.031 [0.00]	-0.025 [0.00]	-0.017 [0.00]	-0.025 [0.01]	-0.023 [0.00]	-0.037 [0.00]	-0.029 [0.00]
Total Income	0.117 [0.01]	0.083 [0.01]	0.065 [0.01]	0.092 [0.02]	0.088 [0.00]	0.129 [0.00]	0.108 [0.00]
R^2	0.39	0.36	0.4	0.41	0.43	0.35	0.32
Hausman's Test	[0.39]	[0.42]	[0.27]	[0.36]	[0.40]	[0.34]	[0.32]
LM Test	[0.28]	[0.32]	[0.18]	[0.29]	[0.20]	[0.23]	[0.22]
RESET Test	[0.14]	[0.25]	[0.19]	[0.23]	[0.16]	[0.18]	[0.15]
Sub-Wald	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
Avg-Wald	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Exp-Wald	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.01]	[0.00]

Table 1.
Panel Linear Estimations (Continued)

	Norway	Denmark	Switzerland	Australia	New Zealand	France
Constant	0.418	0.385	0.407	0.655	0.528	0.439
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]
Assets	1.316	1.504	1.528	1.741	1.609	1.539
	[0.00]	[0.00]	[0.01]	[0.01]	[0.01]	[0.00]
yc(-1)	0.174	0.158	0.172	0.215	0.209	0.195
	[0.20]	[0.36]	[0.24]	[0.23]	[0.24]	[0.15]
Male	0.037	0.044	0.049	0.095	0.084	0.104
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.029	-0.039	-0.037	-0.079	-0.065	-0.094
	[0.02]	[0.03]	[0.01]	[0.02]	[0.00]	[0.00]
Education	-0.024	-0.039	-0.033	-0.084	-0.078	-0.078
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]
Number of Children	-0.025	-0.036	-0.032	-0.058	-0.046	-0.063
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.094	0.098	0.102	0.151	0.117	0.216
	[0.02]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]
R^2	0.29	0.33	0.4	0.39	0.36	0.42
Hausman's Test	[0.28]	[0.30]	[0.35]	[0.21]	[0.33]	[0.24]
LM Test	[0.35]	[0.31]	[0.24]	[0.30]	[0.34]	[0.16]
RESET Test	[0.17]	[0.26]	[0.26]	[0.19]	[0.24]	[0.18]
Sub-Wald	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.01]
Avg-Wald	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Exp-Wald	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.01]

B. Baseline Nonlinear Results

Our methodology follows those of Enders and Granger (1998) and Hansen (1999), which permit regimes to be identified by the same threshold variable. In our case, we make use of a two-regime model with one threshold variable, related to the business cycle. With this format, we consider the impact of booming and recessionary conditions on portfolio choice. In this methodological framework, each regime is characterized by different slopes. The two business cycle regimes considered are recession and boom. Thus, the modeling approach yields:

$$\begin{aligned} risky\ share_{it} = {} & \left[aX_{it} + b_{11}assets_{it} + b_{12}yc_{t-1} + c_i\right] I\left(yc_{t-1} > 0\right) + \\ & \left[aX_{it} + b_{13}assets_{it} + b_{14}yc_{t-1} + c_i\right] I\left(yc_{t-1} \leq 0\right) + e_{it} \end{aligned} \quad (2)$$

where the dependent variable is the percentage of risky asset holdings (out of total financial assets); $i = 1, \ldots, N$ for each household in the panel; and $t = 1, \ldots, T$ refers to the time period. X denotes the same vector of demographic control variables as above, *yc* is again the cyclical component of GDP and *I*(.) is the indicator function. If the cyclical component of output is greater than zero, we define an expansionary business cycle phase, while the opposite is true if the cyclical component of output is less than zero. We make use of a fixed effects transformation and least squares (LS). The error term (*e*) is assumed to follow an *iid* process with zero mean and finite variance.

Empirical findings are reported in Table 2. The signs of the control variables are again as expected, and the coefficients are statistically significant across both regimes. In terms of the business cycle effect, the share of risky assets is found to be procyclical and statistically significant across all countries and across both regimes, indicating that there is a positive relationship between the share of risky assets and the business cycle. In other words, during booms, individuals increase their risky investment shares, while in recessionary periods they reduce risky investments in their portfolios. Moreover, the estimated coefficients of the cyclical component of income are higher over the recessionary periods of the cycle vis-à-vis those over the expansionary periods. This implies that output growth increases investment in risky assets by less than the negative output growth rates decrease investments in risky assets. These findings indicate that the various business cycle periods exert a heterogeneous impact on portfolio decisions, which remains robust across all countries under investigation.

Overall, the impact of the business cycle effect is stronger for those decisions taken during recessionary periods than those taken during expansionary periods. Such portfolio decisions could be attributed to the fact that risk tends to increase in recessionary periods, which is undesirable for risk-averse investors. Another potential explanation relates to the fact that recessions tend to exacerbate the magnitude of ambiguity, which may be responsible for the effects on portfolio decisions as well as those on equilibrium asset prices. Note that given the structure of the risky asset portfolio, additional risk originating from indirect exposure to these financial assets through labor market pension schemes is also considered. This exacerbates investor selling of risky assets. Moreover, the restructuring of portfolios, mostly away from risky investment, during recessionary phases of the cycle could be clearly attributed to the "flight to safety" hypothesis (e.g., Caballero and Kurlat, 2008; DeLong, 2010; Cochrane, 2011). The estimated differences across booms and recessions are that the assessment of risky prospects reacts faster at the onset of the recession. Therefore, given that risky accounts include foreign asset holdings and that households actively sell their risky assets in recessions, the question of who would buy can be examined through the presence of either foreign or domestic investors who consider falling asset prices a good opportunity.

These results are similar to those reached by Malmendier and Nagel (2011), who show that household expectations regarding financial returns and their decisions to invest in risky securities are very sensitive to stock market conditions, given that stock market performance follows in a persistent way that of business cycle performance. Our analysis suggests that the performance of the macroeconomy radically changes participation of investors in the market for risky investments.

Table 2.
Non-linear Panel Estimates: Baseline Results

This table reports the non-linear modeling approach yields: $risky\ share_{it} = [aX_{it} + \beta_{11}\ assets_{it} + \beta_{12}\ yc_{t-1} + \alpha_i]\ I\ (yc_{t-1}>0) + [aX_{it} + \beta_{13}\ assets_{it} + \beta_{14}\ yc_{t-1} + \alpha_i]\ I\ (yc_{t-1} \leq 0) + e_{it}$, where the dependent variable is the percentage of risky asset holdings, $i = 1, \ldots, N$ for each household in the panel, while $t = 1, \ldots, T$ refers to the time period. X denotes a vector of the demographic control variables, such as education, gender, marital status and the number of children. Assets describe total assets, while *yc* is the cyclical component of GDP. The parameter α_i allows for the possibility of fixed effects. $I(.)$ is the indicator function. The error term (e) is assumed to follow an *iid* process with zero mean and finite variance. Figures in brackets denote *p*-values LR is the likelihood ratio test for the null of no threshold whose *p*-value is computed through the bootstrap as suggested by Hansen (1996). N. bootstrap is the number of bootstrap replications used to compute the *p*-value.

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
			1st Regime (yc_{t-1}>0)				
Constant	0.476	0.487	0.539	0.428	0.512	0.492	0.426
	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.165	1.279	1.168	1.281	1.387	1.354	1.442
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.228	0.295	0.219	0.256	0.235	0.252	0.296
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Male	0.043	0.039	0.027	0.064	0.046	0.051	0.047
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]
Marital Status	-0.056	-0.035	-0.026	-0.057	-0.04	-0.063	-0.044
	[0.00]	[0.00]	[0.00]	[0.02]	[0.00]	[0.00]	[0.01]
Education	0.042	0.027	0.029	0.051	0.045	0.067	0.049
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of	-0.029	-0.028	-0.032	-0.034	-0.033	-0.036	-0.03
Children	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.145	0.093	0.074	0.145	0.137	0.148	0.134
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
			2nd Regime (yc_{t-1}≤0)				
Constant	0.368	0.411	0.462	0.387	0.429	0.428	0.366
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.054	1.191	1.085	1.073	1.072	1.241	1.209
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.418	0.456	0.497	0.464	0.458	0.414	0.46
	[0.06]	[0.07]	[0.05]	[0.04]	[0.07]	[0.05]	[0.03]
Male	0.041	0.036	0.025	0.061	0.043	0.046	0.044
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.052	-0.031	-0.024	-0.053	-0.036	-0.06	-0.041
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]
Education	0.04	0.024	0.026	0.048	0.042	0.063	0.045
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of			-0.031	-0.03	-0.029	-0.033	-0.028
Children			[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income			0.065	0.129	0.122	0.126	0.119
			[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Adjusted R^2			0.41	0.44	0.45	0.38	0.35
LR-Test			44.58	28.73	32.95	26.48	30.94
p-value			[0.00]	[0.00]	[0.00]	[0.01]	[0.00]
N. bootstrap			1000	1000	1000	1000	1000

Table 2.
Non-linear Panel Estimates: Baseline Results (Continued)

	Norway	Denmark	Switzerland	Australia	New Zealand	France
			1st Regime ($yc_{t-1}>0$)			
Constant	0.374	0.367	0.345	0.481	0.398	0.356
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.165	1.249	1.374	1.542	1.482	1.129
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.245	0.249	0.245	0.273	0.291	0.285
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]
Male	0.035	0.046	0.048	0.064	0.062	0.067
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.027	-0.04	-0.035	-0.061	-0.056	-0.064
	[0.00]	[0.00]	[0.00]	[0.02]	[0.00]	[0.00]
Education	0.036	0.053	0.05	0.091	0.083	0.093
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of Children	-0.049	-0.055	-0.043	-0.057	-0.046	-0.086
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.135	0.142	0.146	0.175	0.151	0.192
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
			2nd Regime ($yc_{t-1}\leq0$)			
Constant	0.246	0.271	0.254	0.319	0.273	0.268
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.056	1.137	1.241	1.209	1.328	1.062
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.354	0.398	0.358	0.431	0.416	0.354
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]
Male	0.032	0.044	0.043	0.06	0.057	0.061
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.024	-0.038	-0.038	-0.055	-0.051	-0.059
	[0.00]	[0.00]	[0.00]	[0.00]	[0.02]	[0.00]
Education	0.034	0.05	0.046	0.083	0.075	0.088
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of Children	-0.045	-0.051	-0.04	-0.052	-0.043	-0.082
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.124	0.121	0.139	0.156	0.138	0.16
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Adjusted R^2	0.35	0.36	0.4	0.39	0.39	0.47
LR-Test	33.8	32.16	39.01	31.83	40.75	25.63
p-value	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000

V. ROBUSTNESS TESTS

A. Alternative Definitions of Business Cycle

Given that in a long business cycle $yc_t < 0$ may appear in the upside trend of business cycle, and $yc_t > 0$ may appear in the downside trend, we repeat our empirical analysis as an extension of the Hansen (1999) model. In particular, we use a panel data model where the regimes are determined by a different threshold variable. The new version of the model takes the form:

$$risky\ share_{it} = [aX_{it} + b_{11}assets_{it} + b_{12}yc_{t-1} + c_i]I(yc_{t-1} > \gamma) + [aX_{it} + b_{11}assets_{it} + b_{12}yc_{t-1} + c_i]I(yc_{t-1} \leq \gamma) + \eta_{it} \quad (3)$$

where γ is the threshold point and, as the empirical analysis identifies below, is expected to be different for each country under study. Below that threshold point, the country is within a recessionary period, while above it the country is in an expansionary period. The new empirical findings are reported in Table 3 and they again document that recessionary periods highlight individuals who dispose of their risky assets more strongly than they invest in them over expansionary periods, with the results remaining robust across all countries under investigation. In particular, when for the case of the U.K. the threshold γ is 0.208 for example, portfolio choice decisions are tested for growth rates below and above 0.21%.

Table 3.
Non-linear Panel Estimates under Multiple Thresholds

The table reports the new non-linear modeling approach is as follows: $risky\ share_{it} = [aX_{it} + \beta_{11}\ assets_{it} + \beta_{12}\ yc_t + \alpha_i]\ I\ (yc_{t-1}>\gamma) + [aX_{it} + \beta_{11}\ assets_{it} + \beta_{12}\ yc_t + \alpha_i]\ I\ (yc_{t-1}\leq\gamma) + \eta_{it}$. The remaining notes are similar to those in Table 2.

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
			1st Regime ($yc_{t-1}>\gamma$)				
Constant	0.117	0.142	0.125	0.138	0.116	0.107	0.129
	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.042	1.063	1.032	1.094	1.049	1.025	1.067
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.165	0.192	0.128	0.174	0.181	0.174	0.148
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Male	0.036	0.032	0.021	0.046	0.037	0.04	0.037
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]
Marital Status	-0.047	-0.028	-0.02	-0.046	-0.032	-0.051	-0.035
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]
Education	0.032	0.021	0.022	0.043	0.037	0.058	0.042
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of	-0.021	-0.02	-0.026	-0.028	-0.029	-0.031	-0.026
Children	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.132	0.083	0.064	0.105	0.114	0.122	0.109
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

Table 3.
Non-linear Panel Estimates under Multiple Thresholds (Continued)

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
			2nd Regime ($yc_{t-1} \leq \gamma$)				
Constant	0.168	0.174	0.142	0.157	0.129	0.124	0.165
	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.354	1.396	1.383	1.219	1.274	1.142	1.126
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.486	0.459	0.492	0.467	0.458	0.477	0.464
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Male	0.04	0.036	0.024	0.052	0.041	0.044	0.042
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]
Marital Status	-0.051	-0.032	-0.023	-0.052	-0.037	-0.055	-0.041
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]
Education	0.037	0.024	0.026	0.046	0.042	0.063	0.045
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of	-0.025	-0.024	-0.029	-0.031	-0.032	-0.034	-0.028
Children	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.136	0.085	0.071	0.129	0.131	0.14	0.126
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.208	0.252	0.113	0.185	0.174	0.095	0.073
[*p*-value]	[0.01]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]
Adjusted R^2	0.38	0.37	0.43	0.46	0.49	0.42	0.39
LR-Test	32.27	35.52	41.77	26.34	30.46	23.8	28.42
p-value	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000	1000

Table 3.
Non-linear Panel Estimates under Multiple Thresholds (Continued)

	Norway	Denmark	Switzerland	Australia	New Zealand	France
			1st Regime ($yc_{t-1} > \gamma$)			
Constant	0.193	0.156	0.184	0.146	0.152	0.139
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.164	1.182	1.157	1.206	1.154	1.169
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.226	0.237	0.281	0.26	0.257	0.236
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]
Male	0.034	0.049	0.046	0.064	0.068	0.069
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.027	-0.041	-0.035	-0.066	-0.057	-0.065
	[0.00]	[0.00]	[0.00]	[0.02]	[0.00]	[0.00]
Education	0.033	0.052	0.048	0.084	0.081	0.092
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of Children	-0.051	-0.055	-0.046	-0.06	-0.051	-0.084
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

Table 3.
Non-linear Panel Estimates under Multiple Thresholds (Continued)

	Norway	Denmark	Switzerland	Australia	New Zealand	France
Total Income	0.136	0.127	0.141	0.129	0.135	0.142
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1} \leq \gamma$)						
Constant	0.249	0.275	0.259	0.184	0.189	0.263
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.356	1.398	1.395	1.412	1.495	1.496
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.452	0.463	0.458	0.476	0.495	0.48
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]
Male	0.039	0.051	0.049	0.068	0.07	0.073
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.03	-0.043	-0.039	-0.065	-0.059	-0.068
	[0.00]	[0.00]	[0.00]	[0.02]	[0.00]	[0.00]
Education	0.038	0.056	0.052	0.104	0.089	0.096
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of Children	-0.053	-0.057	-0.048	-0.062	-0.053	-0.088
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.157	0.16	0.164	0.182	0.188	0.198
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.256	0.263	0.237	0.256	0.235	0.311
[*p*-value]	[0.02]	[0.02]	[0.01]	[0.00]	[0.01]	[0.00]
Adjusted R^2	0.42	0.39	0.47	0.48	0.45	0.42
LR-Test	30.75	37.83	44.79	35.61	27.05	31.58
p-value	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000

B. Role of Interaction Terms

In relation to the above arguments, during recessions, households may choose to hold less risky financial assets, such as stocks, but may not dump all of them if they already participate in the stock market. Some households may decide to leave the market completely when the economy worsens, but those who decide to stay may not lower their share holdings at all. Experienced investors tend to be among the latter, since when the market falls, they often see buying opportunities. Therefore, it would be interesting to test how these decisions interact with demographic characteristics, such as education, marital status, and number of children. To this end, we re-estimate equation (2) including the following interaction effects: share of risky assets times education, share of risky assets times gender, share of risky assets times marital status, and share of risky assets times number of children. The new regression model yields:

$$risky\ share_{it} = [aX_{it} + b_{11}assets_{it} + b_{12}yc_{t-1} + c_i + b_{13}risky\ share_{it}xmale + b_{14}risky\ share_{it}xeducation + b_{15}risky\ share_{it}xmarital\ status + b_{16}risky\ share_{it}xnumber\ of\ children]I(yc_{t-1} > \gamma) + [aX_{it} + b_{17}assets_{it} + b_{18}yc_{t-1} + c_i + b_{19}risky\ share_{it}xmale + b_{20}risky\ share_{it}xeducation + b_{21}risky\ share_{it}xmarital\ status + b_{22}risky\ share_{it}xnumber\ of\ children]I(yc_{t-1} \le \gamma) + v_{it} \quad (4)$$

The robustness of empirical results is shown in Table 4. The sign of the control (demographic) variables remains consistently robust, while cyclical income retains its procyclical character across regimes, with shares in risky assets indicating stronger responses to recessionary periods than to expansionary periods. Concerning the interaction terms, the empirical findings indicate the following: i) Both coefficients β_{13} and β_{19} are positive and statistically significant. However, the former is weaker than the latter, implying that as the recession deepens, male investors hold risky assets to a greater extent than in the case of the booming stage. ii) Both coefficients β_{14} and β_{20} are positive and statistically significant, with the former being less than the latter, implying that as recessionary periods deteriorate, educated investors hold more risky assets compared to expansionary period. This behavior is attributed to the fact that educated investors see more investment opportunities during recessions. iii) Both coefficients β_{15} and β_{21} are negative and statistically significant. Once again, the former is less than the latter, implying that as the recession deepens, married investors hold more risky assets compared to expansionary periods. iv) Both coefficients β_{16} and β_{22} are negative and statistically significant. The former is again weaker than the latter, implying that as the recession deepens, investors with more children hold risky assets to a greater extent than the same investors do in the expansionary period.

Table 4.
Non-linear Panel Estimates and Interaction Terms

The table reports the new non-linear modeling approach yields:
risky share$_{it}$ = $[aX_{it} + \beta_{11}\ assets_{it} + \beta_{12}\ yc_t + \alpha_i + \beta_{13}\ risky\ share_{it}\ x\ male + \beta_{14}\ risky\ share_{it}\ x\ education + \beta_{15}\ risky\ share_{it}\ x\ marital\ status + \beta_{16}\ risky\ share_{it}\ x\ number\ of\ children]\ I\ (yc_{t-1}>\gamma) + [aX_{it} + \beta_{17}\ assets_{it} + \beta_{18}\ yc_t + \alpha_i + \beta_{19}\ risky\ share_{it}\ x\ male + \beta_{20}\ risky\ share_{it}\ x\ education + \beta_{21}\ risky\ share_{it}\ x\ marital\ status + \beta_{22}\ risky\ share_{it}\ x\ number\ of\ children]\ I\ (yc_{t-1}\le\gamma) + v_{it}$

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
			1st Regime ($yc_{t-1}>\gamma$)				
Constant	0.375	0.381	0.462	0.309	0.364	0.286	0.338
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.184	1.152	0.894	1.283	1.198	1.283	1.291
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.207	0.261	0.246	0.259	0.194	0.283	0.208
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Male	0.045	0.036	0.028	0.049	0.038	0.05	0.042
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.054	-0.029	-0.02	-0.043	-0.035	-0.064	-0.037
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Education	0.036	0.025	0.023	0.027	0.038	0.059	0.046
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

Table 4.
Non-linear Panel Estimates and Interaction Terms (Continued)

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
Number of Children	-0.024	-0.019	-0.023	-0.028	-0.027	-0.031	-0.025
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.127	0.104	0.093	0.152	0.129	0.141	0.134
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{13}	0.124	0.127	0.064	0.139	0.126	0.117	0.108
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{14}	0.095	0.091	0.053	0.082	0.078	0.064	0.057
	[0.01]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
β_{15}	-0.074	-0.082	-0.067	-0.105	-0.112	-0.087	-0.102
	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{16}	-0.063	-0.071	-0.046	-0.076	-0.082	-0.062	-0.068
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

Table 4.
Non-linear Panel Estimates and Interaction Terms (Continued)

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
			2nd Regime ($yc_{t-1} \leq \gamma$)				
Constant	0.394	0.402	0.485	0.358	0.381	0.365	0.382
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.245	1.229	1.148	1.345	1.289	1.326	1.317
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.473	0.418	0.465	0.49	0.446	0.431	0.486
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Male	0.049	0.04	0.034	0.056	0.043	0.055	0.047
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.057	-0.033	-0.024	-0.046	-0.039	-0.065	-0.039
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Education	0.038	0.028	0.024	0.03	0.039	0.062	0.049
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of Children	-0.026	-0.023	-0.027	-0.034	-0.029	-0.035	-0.028
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.162	0.147	0.132	0.181	0.194	0.189	0.164
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{19}	0.129	0.133	0.068	0.145	0.145	0.136	0.126
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{20}	0.098	0.096	0.057	0.086	0.083	0.067	0.059
	[0.01]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
β_{21}	-0.076	-0.085	-0.07	-0.114	-0.117	-0.09	-0.115
	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

Table 4.
Non-linear Panel Estimates and Interaction Terms (Continued)

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
β_{22}	-0.067	-0.075	-0.048	-0.078	-0.085	-0.066	-0.071
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.246	0.274	0.161	0.224	0.192	0.119	0.115
[*p*-value]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Adjusted R^2	0.44	0.4	0.46	0.47	0.48	0.41	0.39
LR-Test	28.05	36.27	36.13	28.34	36.52	29.71	32.17
p-value	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000	1000

Table 4.
Non-linear Panel Estimates and Interaction Terms (Continued)

	Norway	Denmark	Switzerland	Australia	New Zealand	France
			1st Regime ($yc_{t-1}>\gamma$)			
Constant	0.235	0.178	0.256	0.199	0.273	0.280
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.075	1.157	1.156	1.284	1.148	1.053
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.253	0.194	0.189	0.164	0.149	0.185
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Male	0.023	0.04	0.034	0.051	0.048	0.052
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.017	-0.031	-0.023	-0.046	-0.037	-0.052
	[0.02]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Education	0.024	0.04	0.035	0.068	0.06	0.078
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of Children	-0.034	-0.037	-0.026	-0.042	-0.031	-0.063
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.085	0.081	0.074	0.116	0.064	0.125
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{13}	0.083	0.123	0.116	0.124	0.113	0.085
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{14}	0.071	0.082	0.091	0.109	0.083	0.084
	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{15}	-0.084	-0.125	-0.114	-0.089	-0.105	-0.087
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{16}	-0.056	-0.097	-0.089	-0.064	-0.083	-0.052
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

Table 4.
Non-linear Panel Estimates and Interaction Terms (Continued)

	Norway	Denmark	Switzerland	Australia	New Zealand	France
			2nd Regime ($yc_{t-1} \leq \gamma$)			
Constant	0.258	0.186	0.295	0.304	0.346	0.379
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Assets	1.354	1.378	1.361	1.425	1.389	1.342
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
yc(-1)	0.431	0.346	0.395	0.348	0.39	0.356
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Male	0.027	0.045	0.038	0.056	0.053	0.057
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Marital Status	-0.019	-0.035	-0.026	-0.049	-0.041	-0.056
	[0.02]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Education	0.026	0.044	0.038	0.073	0.065	0.083
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of Children	-0.038	-0.04	-0.029	-0.046	-0.035	-0.068
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Total Income	0.135	0.119	0.146	0.162	0.148	0.154
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{19}	0.086	0.139	0.13	0.145	0.138	0.117
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{20}	0.075	0.124	0.118	0.136	0.132	0.125
	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{21}	-0.088	-0.146	-0.135	-0.127	-0.137	-0.114
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_{22}	-0.058	-0.107	-0.098	-0.075	-0.088	-0.056
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.273	0.284	0.258	0.269	0.26	0.337
[*p*-value]	[0.03]	[0.01]	[0.00]	[0.01]	[0.02]	[0.02]
Adjusted R^2	0.39	0.46	0.51	0.45	0.42	0.53
LR-Test	32.51	40.16	38.33	32.47	34.1	35.72
p-value	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000

C. Asset Risk Grids

In this strand of robustness tests, we explore how business cycle effects on risk sharing can be differentiated (or not) under different asset risk grids. A household's investment options comprise different combinations of asset classes. Knowing their risk characteristics can help us reach safer conclusions about how business cycle effects determine portfolio choice. In particular, we repeat the baseline results reported in Table 2, but this time we classify the portfolio of assets used in the empirical analysis into the following four grids:

Safe assets = checking accounts, savings accounts, money market accounts

Low risk assets = certificates of deposit, government bonds, cash value of life insurance, mutual funds invested in tax-free bonds, mutual funds invested in government-backed bonds, trusts and annuities invested in bonds, life insurance, pension plans

Medium-risk assets = mortgage-backed bonds, foreign bonds, corporate bonds

High-risk assets = stocks and brokerage accounts, mutual funds invested in stock funds, trusts and annuities invested in stocks or real estate, pension plans characterized as thrift, profit-sharing or stock purchases.

The results are reported in Table 5. To save space, only the coefficients of the relevant business cycle variables across countries are reported (the control variables retain their sign; these findings are available upon request). The results document that across recessionary periods, income affects investors' holdings of all categories of asset risk grids more intensively vis-à-vis over the expansionary periods, with the stronger effect on medium-risk assets, followed by the high-risk asset category. Over expansionary periods, the income variable affects investor holdings of all four asset grids, with the highest coefficient corresponding to the medium-risk asset class, followed again by the high-risk asset class.

Table 5.
Robust Non-Linear Tests: Asset Risk Grids

This table reports the results similar to those in Table 2.

	U.K.	**Germany**	**Italy**	**Japan**	**Canada**	**Netherlands**	**Sweden**
				Safe Assets			
1st Regime ($yc_{t-1}>\gamma$)	0.062	0.057	0.051	0.046	0.043	0.052	0.044
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1}\leq\gamma$)	0.158	0.166	0.149	0.187	0.235	0.159	0.147
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.215	0.219	0.137	0.182	0.154	0.084	0.079
Adjusted R^2	0.43	0.42	0.39	0.51	0.54	0.38	0.39
LR-test	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000	1000

Table 5.
Robust Non-Linear Tests: Asset Risk Grids (Continued)

	U.K.	Germany	Italy	Japan	Canada	Netherlands	Sweden
Low-Risk Assets							
1st Regime ($yc_{t-1}>\gamma$)	0.088	0.076	0.08	0.129	0.148	0.096	0.09
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1}\leq\gamma$)	0.175	0.192	0.168	0.319	0.274	0.206	0.198
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.227	0.23	0.152	0.193	0.169	0.096	0.091
Adjusted R^2	0.45	0.42	0.38	0.46	0.57	0.46	0.39
LR-test	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000	1000
Medium-Risk Assets							
1st Regime ($yc_{t-1}>\gamma$)	0.128	0.137	0.181	0.164	0.158	0.136	0.142
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1}\leq\gamma$)	0.235	0.249	0.226	0.325	0.342	0.264	0.193
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.235	0.239	0.166	0.202	0.183	0.109	0.113
Adjusted R^2	0.43	0.4	0.41	0.44	0.52	0.49	0.42
LR-test	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000	1000
High-Risk Assets							
1st Regime ($yc_{t-1}>\gamma$)	0.123	0.118	0.125	0.108	0.114	0.094	0.103
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1}\leq\gamma$)	0.226	0.215	0.223	0.269	0.278	0.227	0.234
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.232	0.235	0.158	0.196	0.177	0.097	0.102
Adjusted R^2	0.4	0.38	0.39	0.44	0.53	0.38	0.43
LR-test	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000	1000

Table 5.
Robust Non-Linear Tests: Asset Risk Grids (Continued)

	Norway	Denmark	Switzerland	Australia	New Zealand	France
			Safe Assets			
1st Regime ($yc_{t-1}>\gamma$)	0.046	0.048	0.052	0.037	0.046	0.037
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1}\leq\gamma$)	0.136	0.151	0.173	0.15	0.165	0.172
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.234	0.239	0.217	0.224	0.225	0.275
Adjusted R^2	0.36	0.39	0.43	0.48	0.47	0.44
LR-test	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000
			Low-Risk Assets			
1st Regime ($yc_{t-1}>\gamma$)	0.092	0.097	0.104	0.061	0.077	0.092
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1}\leq\gamma$)	0.182	0.178	0.194	0.16	0.167	0.181
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.24	0.243	0.225	0.229	0.234	0.283
Adjusted R^2	0.4	0.42	0.46	0.49	0.48	0.45
LR-test	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000
			Medium-Risk Assets			
1st Regime ($yc_{t-1}>\gamma$)	0.075	0.081	0.084	0.062	0.068	0.082
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1}\leq\gamma$)	0.165	0.174	0.186	0.143	0.152	0.177
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.247	0.249	0.236	0.24	0.248	0.295
Adjusted R^2	0.42	0.43	0.47	0.44	0.47	0.49
LR-test	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000
			High-Risk Assets			
1st Regime ($yc_{t-1}>\gamma$)	0.124	0.119	0.128	0.083	0.92	0.104
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
2nd Regime ($yc_{t-1}\leq\gamma$)	0.172	0.183	0.195	0.154	0.179	0.181
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
γ	0.242	0.245	0.23	0.233	0.241	0.286
Adjusted R^2	0.27	0.34	0.42	0.44	0.36	0.38
LR-test	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
N. bootstrap	1000	1000	1000	1000	1000	1000

VI. CONCLUSION

This empirical study attempts to provide new empirical insight into the impact of business cycles on portfolio choice characteristics. After identifying the statistical inadequateness of a linear specification to provide significant results, and using nonlinear measures of business cycles along with survey studies for the U.K., France, Germany, Japan, the Netherlands, Sweden, Norway, Denmark, Italy, Switzerland, Canada, Australia, and New Zealand spanning the period 1998–2012, our empirical analysis generates a number of interesting results, as follows: i) investors tend to reduce their share of risky investments to a greater extent during the downside of the cycle than they increase their risky investment during the upside of the cycle; ii) as total assets increase in a portfolio, investors increase their share of risky assets across the countries under investigation; iii) investors who are less wealthy and married with children invest less in "risky" assets across all countries; and iv) more educated households invest more in "risky" assets across all countries. These results survive a number of robustness tests, including robustness against time period, grids of asset risk, and the time period of the recent Global Financial Crisis.

These results shed light on the behavior of portfolio decisions across the phases of the business cycle and, thus, provide better explanations of not only portfolio choices, but also the pricing of risk in financial markets across business cycle regimes. These results should also assist markets in comprehending household investment behavior across business cycles. Our findings could also have implications for financial regulators. Easley and O'Hara (2010) argue that a carefully designed market microstructure can reduce the negative effects of ambiguity, amplify the extent of investor risk aversion, and thereby mitigate the impact of (mainly) recessionary phases of the cycle on portfolio decisions.

Our empirical findings are also important to address and compare the stabilizing role of fiscal and monetary policies. In other words, specific forms of taxation of capital income along with monetary policies implemented with specific monetary rules (i.e., Taylor rules) can affect portfolio choice through their effect on business cycles. Overall, both monetary and fiscal policies are powerful in stabilizing and driving the economy to safe ground, which has a significant impact on portfolio decisions.

Nevertheless, understanding portfolio choices remains a fruitful area of research. There are many factors that can impact portfolio choices; therefore, a potential venue of future research is to consider the role of such factors as institutional and political features in explaining portfolio decisions.

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