TI 2019-031/I
Tinbergen Institute Discussion Paper

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Revision: March 2023

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Cognitive Biases in Consumer Sentiment: the Peak-End Rule and Herding*

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March, 2023

Abstract

We show that two heuristics, the peak-end rule and herding, generate biases in indexes of consumer sentiment. Both affect respondents' assessment of past changes in their financial position. Conform the peak-end rule, their answers relate more to extreme detrimental monthly changes than to yearly aggregate changes in key financial and macro variables. These effects are stronger when particular variables are more salient. The evidence for irrational herding consists in the answers of second-round respondents being too strongly related to future expectations of first-round respondents. These effects persist when we account for structural differences in sample composition or for the effect of other predictive variables. These biases are hence present outside controlled environments and can explain the relevance of sentiment indexes.

Keywords: Consumer sentiment, cognitive biases, peak-end rule, herding, feedback loops
JEL classification: E71, E32, G41

*The research in this paper has been reviewed and approved by the Internal Review Board of Erasmus School of Economics with reference number ETH2122-0551. We would like to thank Teresa Bago d'Uva, Robin Lumsdaine, Maurizio Montone, Saskia ter Ellen, Dick van Dijk, Peter Wakker, as well as participants at the 2019 ASSA-AEA Conference (Atlanta), Research in Behavioral Finance Conference (2016, Amsterdam) and seminar participants at Erasmus University Rotterdam for comments and feedback, and Pia Di Francesco-Isart for excellent research support. Earlier versions of this paper were circulated with the title "Cognitive Biases and Consumer Sentiment"

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1 Introduction

> The first [survey] is a survey of consumers by the University of Michigan. Started in 1946, it is respected as a leading indicator of whether Americans are planning to spend money or tighten their belts. As such, it is looking grim. The preliminary reading for April was near its lowest point in more than a decade – and, crucially, was 26% lower than its level a year earlier. Falls this sharp are often associated with recessions. *The Economist* (April 30, 2022)

Indexes that measure consumer sentiment are widely used for the construction of leading economic indicators and for predictions in general. For example, the US Conference Board uses its own sentiment index for the construction of its leading economic indicator. However, the nature of their predictive ability is not yet fully understood. Carroll et al. (1994) and Ludvigson (2004) show that they predict consumption, but that this effect cannot be fully explained by their predictive power for consumers' income or wealth. Compared to these and other objectively measured macroeconomic variables, indexes of consumer sentiment contain a subjective component, because they measure how consumers perceive the economic situation. Cognitive biases affecting consumers' perceptions can then explain the predictive ability of these indexes.

In this research we investigate the presence of two specific cognitive biases, being the peak-end rule and herding, when respondents answer the question about changes in their financial situation over the past year. This question, labeled PAGO, is one of the five questions in the monthly Survey of Consumer Attitudes and Behavior (CAB) conducted by the University of Michigan to construct its Index of Consumer Sentiment. The peak-end rule states that agents base their judgement of the sum of a sequence of observations on the most extreme and most recent one in it (Varey and Kahneman, 1992; Fredrickson and Kahneman, 1993; Kahneman et al., 1993). Herding can show up when respondents use the judgements of other respondents when forming their own, and can lead to biases if the judgement of others are wrongly incorporated.

To motivate why we particularly analyze these two biases, we rely on the research framework related to "the heuristics that people use and the biases to which they are prone in various tasks of judgment under uncertainty, including predictions and evaluations of evidence" (Kahneman, 2003, p. 1449). Leading in these heuristics is the interaction, or lack thereof, between what is called system 1 (intuitive judgment) and system 2 (reasoning), which represent two types of cognitive processes. System 1 provides us with judgments that are spontaneous, fast, automatic, effortless, associative and often emotionally charged. They are also governed by habit and therefore difficult to modify. To the contrary, judgments in system 2 are slower, serial, effortful, and deliberately controlled; they are also relatively flexible and potentially rule-governed. Central in the heuristic approach of system 1 is substitution of the assessment target by a property of the target that readily comes to mind (Kahneman and Frederick, 2002; Kahneman, 2003).

The CAB survey is conducted in the form of telephone interviews of 500 randomly picked households. When respondents are asked about past changes in their financial situation on the phone, they may be inclined to take the heuristic approach of system 1 instead of making a more demanding analysis corresponding with system 2, because they have to answer on the spot. Also in less compelling settings such as an on-line survey, respondents typically want to limit their time spent on answers. In system 2, respondent would precisely incorporate all personal and general information to assess changes in their financial situation. In system 1, they substitute easily available information instead, for example extreme or recent realizations during the past year leading to the peak-end rule, or the opinion of others which implies herding. The use of system 1 does not automatically lead to biases, as the outcome may be the same as in system 2. However, because the PAGO question is about past changes, we can formulate testable hypotheses to determine whether these substitutions lead to biases.

Let us first discuss our tests and results for the peak-end rule. If respondents use system 2, the aggregate PAGO-answer should be explained by the past yearly changes in key financial and macroeconomic variables. If the peak-end rule is applied, extremes during the year or recent realizations should have more explanatory power than these past yearly changes. We test this for financial variables, like returns on the stock, bond and housing markets and, changes in interest rates, and for macro variables related to inflation, economic growth and unemployment. Our sample period runs from 1978 to 2021, which we split in three subperiods to accommodate differences in the financial and macroeconomic environment during these 44 years.

Our results provide clear evidence in favor of the peak part of the peak-end rule. If yearly changes explain respondents' aggregate assessment, detrimental extremes experienced during that year have more explanatory power. For example, the yearly return on the S&P500 has an R^2 of 17% over the period 2007–2021, but the largest cumulative decrease during the past year has an R^2 of 33%. The yearly change in the inflation rate has a significantly negative effect on PAGO in the first subperiod (1978-1992) with an R^2 of 55%, but the largest peak has on an R^2 of 62%. In joint regressions, the yearly changes lose their significance. These results remain present when we include the past volatility of the explanatory variables, which shows that the explanatory power of extremes is not caused by respondents' being risk-averse. Our findings are robust to longer and shorter reference periods than exactly one year.

We do not find that extremes always beat past yearly changes. If the yearly change in particular variables is not able to explain the PAGO question, then extremes over the last year do not have explanatory power either. This result may point to the salience or availability bias, meaning that respondents base their answers on variables that have been more salient or easily available over the past year (see Kahneman and Frederick, 2002). The variables that have explanatory power vary over the different subperiods with inflation and interest rates being more relevant in the period from 1978–1992 and the stock and housing market over 2007–2021. Though this variation in relevant variables makes sense intuitively, we cannot use these results to test for salience bias, because we cannot specify a priori which variable should be salient in which period.

The CAB survey enables us to test in a different way for salience and strengthen our results for the peak rule. The survey contains questions about home ownership, investments in stocks and perceived job prospects. We hypothesize that if the peak rule applies to the returns on the S&P500, the effect should be stronger for those respondents owning stocks. And this is indeed what we find. In single regressions, the yearly S&P500 return has an R^2 of 15% (2%) for those (not) owning stocks, whereas the peak rule leads to values of 33% and 14%. We find similar results linking the housing index to home ownership. The evidence for the changes in the unemployment rate by job prospect categories is weaker, but this may related to the unemployment rate not being salient during the period of 1998 to 20221 for which data about job prospects are available.

We do not find evidence for the end part of the peak-end rule. Though the most recent observation is a reasonable proxy for the yearly change, it has no effect when included jointly with the yearly change in a regression. A potential reason for the absence of the end-part may be the design of the survey. Changes in a respondent's financial situation have not ended when the survey takes place, contrary to the evidence in psychology, based on, for instance, watching a movie (see Fredrickson, 2000, for more examples). Contrary to extremes, most recent realizations do not automatically receive media attention, making it less likely that agents are aware of them. For surveys conducted in January, the December observation may be more salient as the end. Our evidence is a bit more favorable for this subsample, but still not convincing. We conclude that the most recent financial or macro observations do not qualify as readily coming to mind.

The second heuristic that we investigate is herding. We examine how the beliefs from respondents that are interviewed earlier in a month influence subsequent respondents. Herding belongs to system 2 and is rational, if agents update their beliefs based on the beliefs of others that have better information. However, if agents put too much weight on the information of others, herding belongs to system 1 and can be considered irrational. To design our analysis of herding, we use the preliminary announcement published each month based on the first 300-330 surveys that have been conducted. This announcement reports the preliminary aggregate value of the index and the aggregate answer to the five constituting questions. If the rational herding of system 2 is present, the preliminary aggregate assessment of the past changes should perfectly predict the aggregate assessment of the respondents that are interviewed after the preliminary announcement.

The preliminary aggregate answers to the questions that relate to future expectations should not add further predictive power, because they relate to the future and not to the past. However, if we find that both the preliminary assessment of the past and expectations about the future predict the post-announcement assessment of the past, this finding indicates that the post-announcement respondents pay too much attention to the sentiment of others.

Our results show the presence of irrational herding. In a regression of the aggregate post-announcement assessment of past financial changes, both the preliminary assessment of past financial changes and the preliminary expectation of future financial changes are significant. We reject the hypotheses corresponding with herding in system 2 that the effect of expected financial changes is absent, and that assessment of past financial changes constitute a perfect predictor (i.e., with a coefficient equal to 1). We also find effects from the preliminary expectation about future business conditions, albeit weaker. The effects cannot be explained by systematic differences in the sample composition between the subsample of respondents interviewed before and after the announcement. In fact, when we account for them, the effects become stronger. We also investigate whether our results may reflect confounding factors as the future expectations of the prelim respondents proxy for other variables in the information set of the post-announcement respondents. To that end, we include the state variables of our investigation of the peak-end rule, and we find again stronger instead of weaker results.

We then show with a simple VAR model how the spread of optimism or pessimism about the future to the assessment of the past creates a feedback loop, as these biased assessment of the past are a source for respondents in the next month to form their assessments and expectations. The effect of shocks to the forward looking variables on PAGO is up to 15% stronger in system 1 than in system 2, and it takes longer before they die out. Because of this feedback loop, shocks to consumer sentiment have stronger knock-on effects and last longer than in system 2, implying that the volatility of consumer sentiment is larger than can be explained in system 2.

The main contribution of our research consists in presenting evidence that the peak-end rule and herding can be found in a macro setting, outside more controlled and laboratory settings. So far, evidence for the peak-end rule in economics pertains to microeconomic settings of assessing advertisements (Baumgartner et al., 1997) and payments streams (Langer et al., 2005). Nasiry and Popescu (2011) argue that consumers use it when setting reference prices. Psychological evidence for the peak-end rule is vast (see surveys by Fredrickson, 2000; Kahneman, 2000). Consistent with this evidence (see also Ariely and Carmon, 2000; Aldrovandi and Heussen, 2011), our evidence is strongest for detrimental peaks, such as large losses in financial markets or rises in inflation or the unemployment rate.

Because we base our analysis on CAB survey data, we can link our results directly to the Index of Consumer Sentiment that is constructed from this survey. As a disadvantage, these data do not contain actual changes in respondents' financial situation, for example, based on respondents' savings and investments. However, even if available, such measures would only provide information on financial wealth, whereas financial situation in the CAB survey has a broader meaning and also includes respondents' housing wealth, human wealth and income. Changes in financial wealth may be offset by changes in these other components. By considering different transformations of changes in key financial and macro variables in our regressions with the reported change in the financial situation as dependent variable, we can distinguish system 1 from system 2 effects and test for the presence of the peak-end rule.

Evidence of herding is largely based on laboratory experiments (see Hommes, 2011, for a survey), because it is generally difficult to account for agents' information sets. Moreover, research into herding focuses on inferences based on the observable actions of agents or resulting pricing information (see, for example, the classical model in Banerjee, 1992 or the more general discussion in Chamley, 2004). The preliminary publication of the survey results creates a direct connection between beliefs and leads to herding in the style of Baddeley et al. (2004). The unique feature of the Michigan survey asking respondents to assess past change in their financial position creates an opportunity to test for irrational herding. We acknowledge that we cannot check whether respondents actually know the preliminary publication, but we interpret our results more generally as an over-reliance on other people's expectation of the future in assessing the past.

Our research complements the literature that investigates biases in relation to forecast accuracy. A large set of papers investigate whether predictions of inflation or other key macro and financial variables show structural biases (such as the overconfidence bias) by analyzing how forecast errors are related to publicly available information (see Bianchi et al., 2022, and references therein). D'Acunto et al. (2022) show how individual characteristics such as cognitive abilities can explain the variation in the errors of inflation forecasts. Our analysis focuses on how individuals form assessments and not expectations, and consequently we investigate different biases. Though assessment errors are not as familiar as forecast errors, research in controlled settings (cited in the previous paragraphs) shows that they exhibit strutrual biases, too. We show that such biases carry over to assessments on the aggregate level. Whereas an analysis of assessment errors of PAGO or similar questions at the individual level would lead to more precise and detailed insights, we are not aware of data sets that have the length of the CAB sample and the required cross-sectional details.

We also contribute to the debate about the meaning of indexes of consumer sentiment next to other macroeconomic variables. Though many authors show that they are useful for forecasting[1],

[1] The predictive value of indexes of consumer sentiment has been investigated mostly for consumer spending, in the

there is less consensus on their added value and the causes of it. Fuhrer (1993) claims that they are only relevant because they predicts other macrovariables and are more timely available. To the contrary, Carroll et al. (1994); Ludvigson (2004) show that the predictive power of the sentiment index does not simply come from predicting household income or wealth, and Souleles (2004) shows this for other macro variables. Barsky and Sims (2012) argue that the predictive power is due to news and not because of "animal spirits". Our finding of the presence of cognitive biases gives another explanation for their information content. If consumers process information in a biased way, the effect of these biases will contribute to the added value of indexes of consumer sentiment in comparison with other macro variables. The setting of on-the-spot answers in a telephone survey may actually be representative of the heuristic approach with which consumers generally assess the economy. In this explanation, the indexes do neither show news that is not yet present in other macro variables (Cochrane, 1994), nor do they capture sudden "animal spirits/taste-shocks" (Blanchard, 1993). Instead, they show how cognitive biases affect consumers' forming of judgments about the economy in a systematic way.

The remainder of this article is structured as follows. In section two we present the theoretical framework of our research. In section three we discuss the data. In section four we investigate the peak-end rule, and we turn to herding in section five. Section six concludes. The paper contains an appendix with supplementary material regarding the data and further results.

2 Theoretical framework

The starting point of our research is the behavioral framework of Kahneman and Tversky (see Kahneman, 2003, for an overview). In this section, we take a closer look at this framework, and relate it to cognitive biases that may arise in indexes of consumer confidence. In particular, we explore the relation with the peak-end rule, herding and the resulting feedback loop.

In the framework of Kahneman and Tversky, cognitive biases are thought of and defined as the distinction between system 1 and system 2. Using the reasoning of system 2 to make assessments requires effort and time, while the intuitive judgements of system 1 come quickly and spontaneously. Therefore, the assessments in system 1 are prone to cognitive biases. Tversky and Kahneman (1974) discuss three types of heuristics that can create these biases when judging the likelihood of an event: representativeness, availability and anchoring (see also Baddeley et al., 2004). These heuristics enlarge the accessibility, which is crucial for assessment by system 1. Representativeness implies

U.S. (Fuhrer, 1988, 1993; Carroll et al., 1994; Bram and Ludvigson, 1998; Ludvigson, 2004; Souleles, 2004), the UK (Acemoglu and Scott, 1994; Easaw et al., 2005) and the Euro area (Dees and Brinca, 2013). There is also evidence that they are useful for more general economic predictions (Taylor and McNabb, 2007) and predictions in financial markets (Baker and Wurgler, 2006; Lemmon and Portniaguina, 2006).

that an agent judges the likelihood of a specific event by how representative it is of the stereotype of that event. Availability means that people judge the likelihood of a specific event by the ease with which they can come up with an example. Anchoring means that people bias the likelihood of a specific event towards an initial value that may come from the problem statement. These heuristics can be seen as the base for cognitive biases: they link to system 1 and deviate from system 2. Kahneman and Frederick (2002) generalize this work to other than probabilistic judgements. They do not adhere to the three types but look for a more general mechanism. According to them the reduction of complex tasks to simpler operations is achieved by an operation of attribute substitution (Kahneman, 2003, p. 1460): "Judgement is said to be mediated by a heuristic when the individual assesses a specified target attribute of a judgement object by substituting another property of that object – the heuristic attribute – which comes readily to mind."

We wonder where heuristics may occur in the construction of the Michigan Index of Consumer Sentiment (ICS). We therefore turn to the interviews in which the judgements are expressed. The composition of the ICS is based on questions that are part of the Michigan Survey of Consumer Attitudes and Behavior (CAB). We introduce these questions first, and then discuss how cognitive biases may be present. The CAB lets respondents choose from a number of answer categories, that are given an ordinal integer value from 1 to 5, with a lower value indicating a better assessment. Respondents can also answer "don't know". The questions and corresponding answer category labels are as follows. We indicate in parenthesis how we will refer to the question.

- We are interested in how people are getting along financially these days. Would you say that you are better off or worse off financially than you were a year ago? (abbreviation PAGO, from Personal finances compared to a year AGO.)

  Category labels: Better now (1), Same (3), Worse now (5).

- Now looking ahead–do you think that a year from now you will be better off financially, or worse off, or just about the same as now? (abbreviation PEXP, from Personal finances EXPected a year from now.)

  Category labels: Better now (1), Same (3), Worse now (5).

- Now turning to business conditions in the country as a whole–do you think that during the next 12 months we'll have good times financially, or bad times, or what? (abbreviation BUS1Y, from BUSiness Conditions 1 Year ahead.)

  Category labels: Good times (1), Good with qualifications (2), Pro-con (3), Bad with qualifications (4), Bad times (5).

- Looking ahead, which would you say is more likely – that in the country as a whole we'll have continuous good times during the next 5 years or so, or that we will have periods of widespread unemployment or depression, or what? (abbreviation BUS5Y from BUSiness conditions 5 Years ahead.)

Category labels: Good times (1), Good with qualifications (2), Pro-con (3), Bad with qualifications (4), Bad times (5).

- Generally speaking, do you think now is a good or a bad time for people to buy major household items? (abbreviation DUR from DURables)

  Category labels: Good (1), Pro-con (3), Bad (5).

Answering the questions takes place in telephone interviews, which invites a quick assessment as interviewees have to answer on the spot. This setting invites judgements in system 1, i.e., by means of heuristics. In system 2 respondents incorporate all different variables in a balanced way, both with regard to their personal financial position and the economic situation in general.

The first heuristic we consider is the peak-end rule. The peak-end rule of Fredrickson and Kahneman (1993) states that agents replace a sum (or average) of a series of hedonic experiences by the most extreme and the final experience. In our setting, it means that agents look at the largest increases or decreases in financial and macro variables and the most recent changes (system 1 judgements), instead of the yearly changes (system 2 judgements). If assessment by system 1 has a large effect on PAGO, we should find that the explanatory power of extremes and recent changes exceeds that of yearly averages. So, in the first part of the research we question whether peak and end experiences are dominant in the final assessment. Unfortunately, we cannot make a comparable reconstruction for the present (DUR) and the future (PEXP, BUS1Y and BUS5Y). In order to find out whether the peak-end rule is at stake, past experiences are required.

Second we concentrate on herding. In system 2, rational herding can occur, which Bikhchandani and Sharma (2000) split in spurious and intentional herding. The first occurs, if all agents update their beliefs in the same way because of the arrival of new information. The second can occur for several reasons: agents may copy others who have better information sets or processing capabilities; they may want to enhance or protect their reputation by following the crowd; or they may want to be part of a group.[2] Herding can also be irrational, which occurs when agents deviate from correct Bayesian learning and put too much weight on others' information. This form of herding can be interpreted as a cognitive bias, as judgements in system 1 deviate from system 2 judgements. Tversky and Kahneman (1974) relate this deviation to anchoring.

To investigate the presence of herding we use the publication design of the survey results. The interviews take place in two rounds during the month. Based on a first round of interviews

[2]These motives for herding go back to Keynes (1930). See also Baddeley (2010) for a discussion.

preliminary results are gathered and published. After a second round of interviews final results are published. The data set of the Michigan Survey enables us to calculate the results based on the interviews after the announcement of the preliminary results. Generally, relationships between the preliminary and post-announcement results can be signs of herding, either rational or irrational. So, there can be a rational relationship between e.g. the values for PAGO based on the preliminary results and and those based on the post-announcement results. In system 2, agents should answer the PAGO question by considering the difference in their own financial position currently and a year ago. They can also use the assessment of others about their changes in their financial position, to the extent that these other agents are in a comparable situation. However, a relationship from the prelim values of one of the forward-looking variables (PEXP, BUS1Y and BUS5Y) to the post-announcement backward-looking variable (PAGO) points at irrational herding. The assessment of the future by one group of agents should not have an effect on another group's assessment of the past. Finding such an effect is again evidence of assessment in system 1, because it means that agents use preliminary future-oriented results from others as heuristics for their own post-announcement PAGO.

The presence of irrational herding can lead to feedback loops. Shocks in the prelim values of PEX, BUS1Y and BUS5Y, can spill over to the post-announcement and consequently the final value for PAGO. If respondents in the next round use the final value of PAGO as an anchor to give their answers to the Michigan Survey, the shocks will further propagate in the system. Further, this effect will repeat itself in the next months.[3] Consequently, we can expect to see larger swings in the ICS and higher volatility than can be explained by objectively measured economic variables.

3 Consumer Sentiment Data

The ICS is calculated from the answers to the five questions in the previous section as follows. First, the percentages of positive and negative replies (i.e. answers with a lower or higher label than the middle label) are calculcated. Both percentages are taken with respect to the total number of respondents, so including "don't know", and are weighted to yield a representative sample of all U.S. Households.[4] Next, the percentage of negative replies is subtracted from the percentage of positive replies, to which 100is added. The aggregate answer then lies in the range $[0, 200]$, with a value of 0 (200) meaning that all respondents are negative (positive), and a value of 100 meaning that positive and negative responses are balanced. Next, the value of the ICS at time t is computed

[3] By construction, the ICS and the constituting variables are bounded, which means that the effect of a shock has to die out eventually.

[4] See https://data.sca.isr.umich.edu/fetchdoc.php?docid=24770 for more information.

as

$$ICS_t = \frac{PAGO_t + PEXP_t + BUS1Y_t + BUS1Y5Y_t + DUR_t}{6.7558} + 2.0, \tag{1}$$

where the sum of the five aggregate answers is divided by the 1966 base period total of 6.7558 and the added 2.0 is a constant to correct for sample design changes from the 1950s.[5] The ICS is a so-called "diffusion index", which is typically scaled with respect to a base period (see Ludvigson, 2004, p. 35, for an example). The values of ICS_t and the constituting aggregate sentiment variables as well are published every month.

Table 1 gives summary statistics of the ICS and the constituting variables over the full sample period from January 1978 until September 2021. Because the ICS has a different scale, its numbers are typically lower than for the constituting series. When the weighted fractions of favorable and unfavorable replies are equal, the ICS takes a value of 76.0. The average value of 86.1 indicates that respondents are on average mildly positive. Respondents were most negative in May 1980, (ICS: 51.7) and most positive in January 2000 (ICS: 112).

[Table 1 about here.]

As a value above 100 for the constituting series indicates that more respondents are positive than negative, we on average observe optimism for all questions, except for business conditions on the long term (BUS5Y). Respondents are most positive about DUR, followed by PEXP, PAGO and BUS1Y. Figure 1 shows that the series share a common factor. Recessions and expansions are clearly present. However, fluctuations are different. This is also reflected in the different standard deviations of the series. The correlations of the constituting variables between 0.67 and 0.87 in Table 1b mean that they are positively related but not copies of each other.

[Figure 1 about here.]

To check whether the series are stationary, we analyze the time-series properties in Appendix A. The results for the ICS, BUS1Y, BUS5Y and DUR series clearly indicate stationarity. The stationarity tests for PAGO and PEXP leave some room for a unit root process. Further analyses show the presence of both AR and MA effects of order 1 or 2. We typically observe that shocks die out slowly, which is related to the overlapping windows to which the questions refer. We consider all series as stationary, and adjust our tests for the strong autocorrelation structure.

[5] There was no constant added until 1972:4 (except for 1972:1), from 19724 until 1981:11 the constant was 2.7, and from 1981:12 to present the constant is 2.0.

4 PAGO and the Peak-End Rule

In this part of our research, we investigate whether respondents are susceptible to the peak-end rule of system 1 when they answer the PAGO question. If this bias is systematic, it will also influence the aggregate value of $PAGO_t$.

4.1 Methodology

Let $y_{i,t}$ be the financial position of respondent i at time t, with t in months. PAGO asks for the change in the financial position over the past year, so the change between $y_{i,t}$ and $y_{i,t-12}$. To answer this question, the respondent can calculate the values for her financial position for both points in time, or she can aggregate the changes over each period in time, as $y_{i,t} - y_{i,t-12} = \sum_{s=0}^{11} \Delta y_{t-s}$, with the operator Δ giving the one-period change in a variable, $\Delta y_{i,t} = y_{i,t} - y_{i,t-1}$. Because a complete calculation of the financial position requires precise and possibly extensive information of a respondent's assets, income, the price level and other relevant components, aggregating a small set of changes may be easier. In particular, she can use the relation with state variables and aggregate their changes. In this approach, the change in the financial position is split in a part that can be explained by a set of m state variables $x_{j,t}$, $j = 1, \dots, m$, and a part unrelated to this set,

$$\Delta y_{i,t} = \sum_{j=1}^{m} \beta_{i,j} x_{j,t} + \eta_{i,t} \tag{2}$$

where $\beta_{i,j}$ is the sensitivity of the respondent's financial position to variable j, and $\eta_{i,t}$ captures the unexplained part. State variables relevant for assets are the changes in stock, bond and house price indexes, whereas changes in price and production indexes or in the unemployment rate are relevant for income and income uncertainty.[6]

In system 2 both ways of answering this question yield the same answer. However, when respondents use system 1, the answers can differ, because individuals show biases when they aggregate over time. In particular, they may use the peak-end rule as termed by Fredrickson and Kahneman (1993). In system 1, they make a heuristic assessment, where they use the most recent and the most extreme change to represent the yearly change.

To investigate how the peak-end rule influences PAGO, we define the different rules r as functions g^r that operate on a sequence of n past observations $\boldsymbol{x}_t^n = (x_{t-n+1}, \dots, x_t)'$ (cf. Cojuharenco and Ryvkin, 2008). We take the variables x_t as flow variables. The function for the rational rule $r = \text{ra}$ equals

$$g^{\text{ra}}(\boldsymbol{x}_t^n) = \sum_{s=1}^{n} x_{t-n+s}. \tag{3}$$

[6] The Michigan survey asks for a reason which can pertain to income, prices, the value of assets, and the value of debt, see https://data.sca.isr.umich.edu/sda-public/sca/Doc/sca.htm.

In system 2, a respondent uses the rational rule and correctly aggregates the flow variables by summing them.

When a respondent uses a peak rule, she pays attention to the largest increase or decrease over a single period or over multiple subsequent periods

$$g^r(\boldsymbol{x}_t^n) = \begin{cases} \max\{x_{t-n+1}, \ldots, x_t\} & \text{for } r = \text{sp} \\ \max\{\sum_{s=p}^{q} x_{t-n+s}; p, q = 1, \ldots, n, p < q\} & \text{for } r = \text{mp} \\ \min\{x_{t-n+1}, \ldots, x_t\} & \text{for } r = \text{st} \\ \min\{\sum_{s=p}^{q} x_{t-n+s}; p, q = 1, \ldots, n, p < q\} & \text{for } r = \text{mt}. \end{cases} \tag{4}$$

In the abbreviation of the rules, s stands for single, m for multiple, p for peak and t for trough. We investigate both peaks and troughs, because the variables need not have an upper or lower bound. The peak rule originates from variables with a lower bound, which makes only the peak relevant.[7] We also allow for the largest cumulative increase or decrease, as they produce the peaks and troughs in the aggregated series. We jointly refer to these four rules as peak rules, and use the abbreviations to point to specific versions.

The end rule only pays attention to the most recent realization in a sequence,

$$g^{\text{e}}(\boldsymbol{x}_t^n) = x_t \tag{5}$$

The respondents can use these different rules to time-aggregate the state variables in Equation (2). Since each rule transforms the time series of the state variables in a different way, the strength of the relations between the PAGO series and the transformed series of the state variables can show which rules are used. We use a linear model to investigate how the different peak-end rules compare to the rational rule for each state variable j,

$$PAGO_t = \alpha + \beta_j^{\text{ra}} g^{\text{ra}}(\boldsymbol{x}_{j,t}^n) + \beta_j^{\text{r}} g^{\text{r}}(\boldsymbol{x}_{j,t}^n) + \varepsilon_t, \quad r = \text{sp, mp, sb, mb, e}, \tag{6}$$

where α is the intercept and ε_t contains the approximation error. The coefficients β_j^{ra} and β_j^{r} indicate how strong the rational and a particular peak-end rule r influence the aggregation of the variable x_j. In system 2, respondents base their answers on a complete and precise assessment of changes in their financial situation, and the rational rule should give the best explanation of $PAGO_t$. The other rules should also not help explaining $PAGO_t$ in addition to the rational rule, corresponding with the hypothesis $\beta_j^{\text{r}} = 0$. In system 1, one of the peak-end rules should give the best explanation of $PAGO_t$. The rational rule should then be of limited importance.

[7] Varey and Kahneman (1992) investigate the assessment of unpleasant experiences, Fredrickson and Kahneman (1993) the assessment of pleasant or aversive film clips, and Kahneman et al. (1993) the assessment of a painful episodes.

To find out whether respondents answer the PAGO question in system 1 or 2, we regress the PAGO series on the yearly changes and the peak-end series that we have created. If system 2 is used, the rational rule should explain $PAGO_t$ best. In a single regression, it should generate a higher R^2 than any of the peak-end rule transformations. In a multiple regression, the coefficients for the peak-end rules should be insignificant. If system 1 is used, a peak-end series should give a higher R^2 in a single regression than the yearly change. When we add a peak-end series next to the yearly change in the regression, the coefficient on the yearly average should become closer to zero and less significant. Because PAGO refers to the yearly change and we use monthly observations, we use HAC standard errors based on Newey and West (1987) with a Bartlett kernel and a bandwidth value of 12.

The answer to the PAGO question may be influenced by risk aversion. Risk-averse respondents prefer smooth over volatile changes. The difference between the peak or trough and the total change during the year is a proxy for the volatility. A multiple regression of the rational and one of the peak rules may hence show the effect of risk aversion. If that is the case, the effect of the peak rule belongs to system 2 instead of 1.

We account for the effect of risk aversion in two ways. First, we focus on the signs of the coefficients. If the respondents use one of the peak rules instead of rational one, their coefficients should have the same sign. If a peak rule proxies for risk aversion, its coefficient should be negative (positive) in case of a peak (trough) rule in a multiple regression with the rational rule. So the coefficient can then switch when moving from a single to a multiple regression. To be more precise, we interpret a sign switch as an indication of a risk aversion effect, when it becomes positive for the single- or multi-peak rule or negative for the single- and multi-trough rule. Second, we conduct regressions that include the volatility of the explanatory variable as a regressor. If risk aversion affects the PAGO question, the volatility should have a negative coefficient. Moreover, if the peak rule proxies for volatility, its effect should diminish, because the volatility is a more precise measure for the variation of the series. Because we use the total yearly change instead of the monthly (or quarterly) average, we also annualize the volatility.

4.2 Explanatory variables

We investigate the different rules for different financial and macro variables. The set of financial state variables consists of the returns on the stock market, proxied by the S&P500, and returns on the bond market, proxied by the ICE Bank of America US Corporate bond index, the 3-month T-Bill rate and 10-year government bond rate, and the All Transactions House Price Index compiled by the US Federal Housing Finance Agency. This last index has a quarterly frequency.

In the set of macro variables we include the growth rates of the consumer price index (CPI), GNP, total nonfarm payrolls (NFP), and personal consumption expenditures (PCE), as well as the change in the unemployment rate. All variables are available at a monthly frequency, except GNP which has a quarterly frequency. Because macro variables are typically published with a lag, we use vintage data made available by the Federal Reserve Bank of St. Louis. We assume that respondents always use the first vintage. We assume that the financial variables do not have a publication lag. More information about the variables is in Appendix B.

To investigate the influence of the different rules, we construct yearly aggregates based on the transformations in Equations (3) to (5). For the monthly (quarterly) series, we always use the twelve (four) most recent observations before the start of a month to construct the yearly aggregates. In total, we construct six series for each variable, the actual yearly change based on the rational rule, the four peak rules, and the end rule. The first rule corresponds with system 2, the other five with system 1 judgements.

The total sample period from 1978 to 2021 comprises different economic environments which is likely to lead to time-variation in the importance of the different state variables. Therefore, we split the sample period in three subsamples of about equal length with the first two ending in June 1992 and December 2006. Tables B.2 and B.3 presents the mean and standard deviation of each series and each transformation, as well as the correlations that the peak-end rule transformations have with the rational rule. Most variables show substantial variation in their means and standard deviations over the three subperiods. This applies to both the series that result from the rational rule and to the series that results from the peak-end rule transformations. During the first subperiod the standard deviations of the inflation rate, bond returns and interest rate changes are high. The second subperiod is fully during the great moderation with low volatility for all macro series. The third subsample contains the credit crisis and the subsequent great recession with low returns for the financial variables and low growth rates for the macro ones.

The correlations of the peak-end rule transformations with the rational rule are mostly positive but generally substantially below 1. Hence they indicate that that peak-end rule leads to series that convey information that is related to but different from the rational rule. The multi-peak and multi-trough (mp and mt) series have by construction more observations in common with the rational rule than the single-peak and single-trough rule which typically leads to higher correlations. The peak-end rule transformations of the two variables at the quarterly frequency (GNP and HPIQ) also have by construction more in common with the rational transformation, which also leads to high correlations. The correlations also vary markedly over the subperiods.

4.3 Results based on all respondents

We concentrate first on the peak rule, and then discuss the end rule. The full set of results for the peak rule, that is for all combinations of explanatory variable, (sub)sample period and peak rule in Appendix B show substantial variation over the different subsample periods, in line with the differences in the economic environment. For example, the yearly return on the stock market has no explanatory power for the first subsample period as indicated by the R^2 of 1% in Table B.4b, but much more in the second and third periods (R^2 of 21 and 17%). The R^2 for the full sample is in between and 10%. For inflation, this pattern is reversed with values for the adjusted R^2 of 55, 3 and -1% for the three subsample periods, and a full-sample R^2 of 9%. Therefore, we focus on the subsample results and the best performing peak rule.

Table 2 displays our main results for the financial variables. For each subsample period, we report the results for the rational rule, and the peak rule that has the highest R^2 in a single regression. We then investigate whether this peak rule drives out the rational rule or vice versa in a multiple regression. Displaying the best performing peak rule may present our results in a favorable light, but our claim is not that each peak rule should have higher explanatory power than the rational rule. The theory is mostly formulated in terms of unpleasant experiences, which means that if the effect is present, we should find it strongest for changes that are detrimental for respondents, so, for example, for troughs in the stock market index and peaks in the inflation rate. However, the theory does not exclude the effect for very pleasant surprises, nor does it specify the duration. We take this into account when interpreting our results.

[Table 2 about here.]

In general the results in Table 2 indicate that the peak rules have more explanatory power than the rational rule when considering financial variables. The rational rule is significant in only 4 out of 15 regressions. To the contrary, the best performing peak rule is significant in 12 regressions. Next, we test whether coefficients of either the rational or the peak rule are zero in a multiple regression. For 8 regressions, a peak rule is significant whereas the rational rule is not. When regressing PAGO on the 3-month T-bill rate for the third subperiod, both are significant, but the coefficient on the multi-trough series switches sign, indicating that the rational rule is preferred. The opposite happens in the first period with HPIQ as regressor, meaning that here the single-peak series is preferred. For 2 regressions (regressors BAMLCC and UST3M in period 2) both coefficients are insignificant, but the peak rule coefficients are significant in a single regression whereas the coefficients for the rational rule are not or only marginally significant. For 3 regressions we do not find any effects at all.

The results also show that the peak rule that is detrimental tends to be the best performing one.

In particular, if the coefficient on the rational rule is positive, so increases in a regressor correspond with higher values of PAGO, then the single- or multi-trough rule comes out best. If the coefficient is negative, so increases are detrimental, the single- or multi-peak rule comes on top. This pattern holds for all regressors and subperiods, except for the stock index in subperiods 1 and 2. For the other four regressors, the coefficients for the rational rule switch signs between subperiods, and the coefficients for the best-performing peak rule switches signs as well.

Risk aversion may drive some of the explanatory power of the peak rules. The single- and multi-peak (trough) rules should then have a negative (positive) coefficient. Whereas these signs indeed show up frequently, they also align with the signs of the rational rule, which means that we cannot distinguish the first order effect of the explanatory variable, i.e. an increases or decrease, from its second order effect, i.e. large or small changes and the curvature. Therefore, we also include the volatility based on the past year of observations as an explanatory variable. If risk aversion is important, volatility should have a negative coefficient. Though the coefficient is mostly negative, it is often not significant and tends to inflate the standard errors. We therefore conclude that risk aversion may have some effect, but is not strong enough to fully place the assessment in system 2.

Zooming in on each regressor separately reveals quite some variation over the different periods. Changes in the S&P500 have hardly any explanatory power in period 1, but they do well in periods 2 and 3. In period 2, the multi-peak rule is better in explaining PAGO than the rational rule, and in period 3 it is the multi-trough rule, with R^2 values of 27 and 33%.[8] This increased importance of the S&P500 may be related to higher participation in the stock market. The Michigan survey asks about stock ownership, and we further use the information in the next subsection. The coefficient of past volatility is positive, which is inconsistent with risk aversion.

The results for the bond market index, the 3-month T-bill rate and the 10-year T-bond rate are comparable. In the first period, interest rate increases are negatively related to PAGO, and since they lead to negative returns in bond markets, bond market returns have a positive coefficient. In the other two periods, the effects are opposite, which may related to the different monetary situation. The explanatory power is concentrated in periods one and three, but largely absent in two. These periods also show that the peak-rules are more informative than the rational rule, except for the T-bill rate in period 3. The coefficients of past volatility vary between positive and negative over the different regressions and are hardly significant. In the regression on the 10-year bond rate in period 3 it is significantly negative, but the sign switches indicate a multicollinearity

[8] The higher explanatory power may seem consistent with a dynamic strategy in which investors divest after large drops in the equity market. However, the mean and standard deviation of the series that result from the multi-trough rule (see Table B.2) indicate that the largest trough in a year does not always correspond with a large drop and can actually be positive.

issue.

Changes in house prices have a negative but insignificant effect in period 1 under the rational rule, but are significant under the single-peak rule. When both rules are combined, the rational rule switches sign, which may indicate multicollinearity. In the second period, changes in house prices do not explain PAGO. In the third subperiod which comprises the credit crisis, the explanatory power is very large with R^2 values of 68 to 75% . In this period, the single-trough series performs best, and drives out the rational rule. For the housing market, the inclusion of volatility points at the effect of risk aversion, as the coefficients are negative and significant in periods 2 and 3. In period 3, the inclusion of volatility also decreases the effect of the single-trough rule.

We next check whether the same results hold for the macro variables. They may not be directly related to changes in the respondents financial position, but still we can expect benign macro developments to have a positive effect. We report the summary of our results in Table 3. As for the financial variables, we find that the peak rules work better than the rational one. Here the best peak rule is significant in 13 out of 15 regressions, whereas the rational rule scores 7. In 6 multiple regression, the peak rule has significant explanatory power and the rational rule has not. In one regression (NFP in period 3), both are significant with also a clear increase in R^2 compared to the single regressions. One regression (UNEMP in period 1) shows that the rational rule is significant and the peak rule not, and in another (PCE in period 2) both are significant, but the sign switch for the peak rule indicates that the rational rule is preferred as well. For the six remaining regressions, neither of the coefficients is significant. This result may be caused by multicollinearity, as indicated by the increase in standard errors and the correlations in Table B.3.

[Table 3 about here.]

We find less evidence that detrimental extremes are more informative than beneficial ones. In 5 of the 15 regressions a positive (negative) sign for the rational rule goes together with the single or multi-trough (peak) being the best performing. The weaker connection between the macro variables and the actual experiences of the respondents may be an explanation of this finding. The inflation rate is the only one that directly influences wealth in real terms, and there the negative coefficients for the rational rule go together with the single-peak rule being the most explanatory in periods 1 and 3, though not in period 2.

Risk aversion seems to offer an alternative explanation for our results less often, as we find less often negative signs for peaks or positive signs for troughs. The coefficients of past volatility also vary in sign, and are hardly significant. Only two regressions (with NFP in period 2, and UNEMP in period 1) yield a negative and significant effect. However, the results of these two regressions did not point to a peak rule to begin with, and suffer from multicollinearity. The limited effect of past volatility does not come unexpectedly, as the relation between PAGO and the macro variables is more remote.

Going over each regression separately shows less switches in sign than for the financial variables, but again quite some variation in the explanatory power. As can be expected, the inflation rate has a negative relation with PAGO that is very strong in period 1 (R^2 up to 62%) which includes the time before the great moderation. The single-peak rule drives out the effect of the rational rule in this period. In period 2, the inflation rate does not explain PAGO. In period 3, the rational rule is not informative at all, but the single peak rule is with an R^2 of 37%. Past volatility has a negative effect in periods 1 and 3, but is insignificant.

Both the growth in GNP and PCE (expenditures) are measure of the performance of the economy in general. GNP growth is not informative at all in period 1, but has mild explanatory power in periods 2 and 3. In both periods, the multi-peak rule is selected. In period 2, it is about equally informative as the rational rule, but the test against each other is indecisive because of multicollinearity. In period 3, the multi-peak rule drives out the rational one. The rational rule applied to growth in (PCE) has some explanatory power in period 2 but none in 1 and 3. To the contrary, the single- and multi-peak rules mildly explain PAGO in all periods. In period 1, the single-peak rule seems stronger than the rational rule, but tests in the multiple regression are plagued by multicollinearity. In period 2, the opposite happens, and the rational rule is favored. In period 3, the evidence favors the multi-peak rule. The sign for volatility switches between negative and positive, and is never significant.

The growth of non-farm payrolls (NFP) and the change in the unemployment rate show the relevance of the labor market for explaining PAGO. Both variables offer more explanatory power than the growth rates of GNP and PCE with R^2 values between 7 and 40%. As expected, coefficients are positive for NFP and negative for the unemployment rate. The analysis of NFP suffers from multicollinearity in periods 1 and 2, but the evidence is in favor of the rational rule here. In period 3 it is less of an issue, and the results indicate that the rational and the multi-peak rule are complementary. With regard to the unemployment rate, the rational rule also wins in period 1, but the single-peak rule does in period 2. The unemployment rate has lost its explanatory power in period 3, with both the rational and peak-rules being insignificant. The effect of past volatility is stronger for these variables than for the other three, but still varies between positive and negative. It does not lead to a different conclusion, as the two regressions in which its coefficient is significantly negative already favored the rational rule over the peak rules.

We conclude that the evidence for the peak rule that has been documented for individuals in (semi)-controlled environments and laboratory settings carries over to real-life economic settings in aggregate. When asked to evaluate change in their financial position over the past year, peak rule transformations of financial and macroeconomic variables tend to have more explanatory power than the rational rule. In line with the micro evidence in favor of unpleasant peaks, we find that in particular for financial variables, peaks that have (on average) detrimental effects to the respondents are the most informative. However, we report quite some variation over time, both in the strength of the different variables, in the particular peak-rule that performs best, and whether the peak rule beats the rational rule. This time variation may actually point to a salience or availability bias, as respondents may apply the availability heuristic and base their answer on variables that have been more easily available or salient over the past year (see Kahneman and Frederick, 2002). This could lead to further evidence for making judgements in system 1, but because we cannot determine the ease with which variables are available, we do not pursue this line of research. We do not find that risk aversion offers an alternative explanation for our results.

We now turn to the end rule and report the evidence for financial variables in Table 4 and macro variables in Table 5. The results show that the end rule does not have more explanatory power than the rational rule. Of the 15 regressions on financial variables, only one yields a significant coefficient for the end rule (HPIQ in period 3), but in a multiple regression, the coefficient in the end rule switches sign, which means that the rational rule is favoured. In regressions on the macro variables, the coefficients for the end rule are significant in 6 regressions, but they become insignificant in the multiple regression with the rational rule. So we conclude that the respondents do not use the end rule when answering the PAGO question.

[Table 4 about here.]

[Table 5 about here.]

One reason that the end rule does not perform well may be that respondents use more recent changes than those in the last month. A respondent interviewed by the end of April may not refer back to changes in March. Therefore, we also investigate the effect of the contemporaneous monthly change in the explanatory variables. We do not include the change in HPIQ or GNP because these variables are quarterly. The results (available in Tables B.6 and B.7) do not lead to a different conclusion. Also in this analysis the end rule does not lead to better performance than the rational rule.

We conclude that the most recent change in the different variables is not "readily available" to respondents as meant by Tversky and Kahneman (1974). A reason that we find evidence for the peak rule but not for the end rule may be that extremes generate more attention in the media and linger longer than the steady flow of new observations. A spike in inflation can make the headlines of the newspapers, whereas the most recent inflation numbers may be hidden somewhere in the economics and finance section. A more fundamental difference with the more controlled settings on which the micro evidence for the end rule is based, is that in the latter the experience is finished. The medical treatment of the movie that respondents assess is over, so there is a clear ending. A respondent's financial situation changes continuously, so the end to the experience is less obvious. We further investigate this issue in Section 4.5.

4.4 Results based on specific groups of respondents

Our results so far provide evidence that the peak rules applied to financial and macro variables have higher explanatory power than the rational rule, though we also observe that some variables do not have any explanatory power at all in some subperiods. Unfortunately, we do and cannot know which variables should be relevant for respondents, nor do we know whether they actually know the variables we use in our analysis. They may have some general recollection of past developments in the stock market, the housing market, or the job market, and the consequences it has for their financial situation. With this we mean a reasoning like "the stock market went down, which led to a decrease in the value of my stock portfolio", but they may not specifically have the S&P500 in mind. Contrary to laboratory settings, one can never know exactly which variables economic agents use to form assessments and expectations.

However, whereas we cannot identify up front which variables should be relevant, we can identify groups of respondents for which a particular variable should have a stronger explanatory effect, if any. The CAB survey asks respondents for particular financial and demographic information and a motivation of their answers. We find four variables based on which we can construct subgroups for which effects should be stronger or weaker. First, the CAB survey asks for investment in stocks. Changes in the S&P500 should be more relevant for respondents that answer positively. Second, respondents that indicate home ownership in the CAB survey should pay more attention to changes in the housing index HPIQ.[9] The third and fourth sample split is motivated by the results in Kuchler and Zafar (2019) who show that local and personal experiences regarding house prices and unemployment are important when agents form expectations. The CAB asks respondents about the likelihood with which they or their family members may lose a job in the next five years. Changes in the unemployment rate should be more relevant for respondents that deem job loss more likely. The CAB also records the region in which respondents live. We check whether the regional unemployment rates, available via FRED, show stronger results compared to the national unemployment rate. We provide the exact questions and answer categories, their summary statistics

[9] The CAB survey has one answer category for respondents that own or are buying their own home. The effect of changes in house prices may be different for owners and buyers, though not necessarily if buyers are selling another house, or if increasing house prices lead to favorable mortgage conditions. The number of buyers may be small compared to the number of owners, which should limit the effect on our analysis. If an effect would be present, the heterogeneity makes it harder to find evidence in favor of the peak rule.

and the full regression results in Appendix B.3.

Our results, which we summarize in Table 6, confirm our hypothesis. The rational rule applied to changes in the S&P500 yields a significant coefficient and an R^2 of 15% for respondents owning stocks compared to an insignificant coefficient and an R^2 of 2% for respondents without. For both groups, the multi-trough series is the best performing rule, but the coefficient is almost twice as large for respondents with stocks, and the R^2 is 33% compared to 14%. In both cases, the multi-trough series outperform the rational rule, with again a stronger effect for the stock-owning respondents as judged by the coefficients in the joint regression and the difference in R^2 between the multiple and single regressions. As in the general analysis in the previous section, risk aversion does not explain these results.

[Table 6 about here.]

The results for the analysis of changes in the housing market index when grouping respondents based on home ownership point in the same direction, though the differences are smaller. The coefficient of the rational rule is 3.07 for home-owning respondents and 2.76 for renting ones, with R^2 values of 54 and 49%. For both groups the multi-trough series perform best, with again larger coefficients and R^2 for owners, and these series also outperform the rational rule. So also here, the troughs over multiple periods, which are detrimental, can better explain PAGO than the aggregate changes. This effect is stronger for respondents who own their house, but it is surprisingly strong even for respondents that rent. Our sample period here include the credit crisis and its aftermath, which originated in the housing market, and consequently had a pronounced effect on everyone. Homeowners were of course more affected, but renters did not escape either.

The analysis in which we split respondents based on how likely they expect to lose their job partially confirms the hypothesis. The rational rule applied to changes in the unemployment rate has a stronger and significant effect when respondents attach a non-zero probability to job loss (-3.94 and -4.08 versus -2.19). However, the effect for respondents that indicate a probability between 50 and 100% is not stronger compared to the category 1-49%. When respondents indicate 0%, the best performing peak rule is the single-trough, but for the non-zero groups, it is the multi-peak. This implies that respondents who may face a job loss pay more attention to increases in the unemployment rate than respondents that are certain of their jobs. However, neither of the peak rules beats the rational rule here. As shown by the results for the job market variables in Table 3, their changes have apparently not been very salient in this particular sample period.

Finally, our comparison of the results for the regional unemployment rates in Table 7 with the national one in Table 3 are partially in line with our hypothesis. In all regions in periods 1 and 2, the single or multi-peak rule beats the rational rule in explaining PAGO. Moreover, in the multiple regression, the peak rule drives out the rational rule 5 times out of 8, and one time both rules are significant. In particular in period 1, the results are stronger than for the national unemployment rate. Period 2 shows more variation in the explanatory power of the unemployment over the regions, and it is generally a bit lower compared to the national results. Neither the regional nor the national unemployment rates seem relevant in period 3 with R^2 below 0.11 when the rational rule is considered, and below 0.03 for the peak rule. Apparently, the unemployment rate was more salient in period 1 than the other 2. However, we cannot relate that to the level, changes or extreme values in the different periods.

[Table 7 about here.]

4.5 Results for different reference periods

Our evidence so far is based on the rational and peak rules applied to the last year of observations, as this is literally what the PAGO question asks for. However, respondents may not be that strict in their recollection and instead use a shorter or longer reference period. Therefore, we also construct series by the rational and peak rules that are based on the past nine months (or three quarters) and on the past fifteen months (or five quarters). With these series, we repeat the analyses reported in Tables 2 and 3.

Our results in Tables B.12 to B.15 show that respondents tend to look further back than the twelve months that correspond with the PAGO question. For almost all variables and subperiods, R^2 values are about 3–4 percentage points higher when the rational and peak rules are applied to a longer set of past observations. The best performing peak rule also stays the same for almost all variables and subperiods. The exceptions are cases where none of the peak rules are informative (e.g. the S&P 500 in the first subperiod), or where the peak rules proxy for volatility (e.g. PCE in the second subperiod). Because we see the same effects for the rational and the best peak rules, the comparison of the two in the multiple regressions yields outcomes that are very much in line with our earlier findings. So also if we account for the longer period that respondents tend to look back, detrimental peaks have higher explanatory power than the aggregated changes over the reference period.

With regard to the end-rule, respondents may not perceive a clear end or final observation of the changes in their financial situation. The evidence of the end-rule is typically based on experiences that have a clear ending such as a medical treatments or films. To the contrary, changes in someone's financial situation are ongoing and do not have a clear ending, and this may explain the absence of evidence for the end-rule. However, the end of a calendar year is typically a moment to take stock, and may more clearly mark the end of a period. If this is the case, the end-rule should have more explanatory power for the PAGO outcome in January, as the most recent observation than pertains to December for the financial variables. The results in Table B.16 provide some support for this hypothesis, as we find some more evidence for the end-rule. In particular, we find that the end-rule beats the rational rule when applied to changes in S&P500, in the 10-year bond yield and the house price index in the second subperiod, and changes in the bond index in the first subperiod. For the other combinations of variables and subperiods, results are more in line with the results in Table 4. We do not conduct this analysis for the macro variables, because the publication lag in these variables means that the observations pertaining to December are available later than January. Overall we conclude that observations in December are more salient than in other months, but this is not sufficiently strong for a substantial effect of the end rule.

5 Herding

We now turn our attention to herding. As argued in Section 2, in system 2 there should be no effect of the one respondent's future expectations (PEXP, BUS1Y and BUS5Y) on the past assessment in PAGO of another respondent, other than what can be explained by the first respondent's past assessment. We interpret the presence of such an effect as evidence of the anchoring heuristic in system 1.

Any analysis of herding outside a laboratory environment is complicated, because the researcher can never completely account for the information set that the respondent uses. A respondent can only process another respondent's expectations after they have been communicated, which means that part of the expectations can already have been realized. We want to exploit the preliminary announcement of the consumer sentiment variables during the month. By comparing the answers before and after the announcement, the overlap between the past year and the coming year (or five years for BUS5Y) included in the announcement is minimal.

5.1 Empirical design

Preliminary values for the ongoing month are generally based on the first 330 out of 500 interviews. These preliminary values are announced on the second or third Friday of the month, based on the interviews until the Wednesday before that Friday. We use the term "final" to refer to the value for each variable based on all interviews for a given month, and "prelim" for the preliminary values. The prelim series are available since January 1991. Based on this announcement schedule we create the "post-announcement" (or"pa") series which starts in January 2000. We construct the pa-series based on the interviews that are taken after the announcement of the preliminary values. To construct them, we use the fully detailed interview results and their weights that are available from January 2000.

We investigate the relation between the post-announcement value of PAGO, $PAGO_t^{\text{pa}}$ and the preliminary values of the forward-looking variables (PEXP, BUS1Y and BUS5Y), collected in a vector $\boldsymbol{x}_t^{\text{prelim}}$, by the linear regression

$$PAGO_t^{\text{pa}} = \alpha + \beta PAGO_t^{\text{prelim}} + \boldsymbol{\gamma}'\boldsymbol{x}_t^{\text{prelim}} + \boldsymbol{\delta}'\boldsymbol{z}_t + \varepsilon_t, \quad \varepsilon_t \sim \text{N}(0, \sigma^2). \tag{7}$$

Because we include $PAGO_t^{\text{prelim}}$ in this regression, $\boldsymbol{\gamma}$ captures the effect that the forward looking variables have after correction for the effect of $PAGO_t^{\text{prelim}}$. We allow for the inclusion of m covariates $\boldsymbol{z}_t$ that account for structural differences between the prelim and pa subsamples.

In system 2, the assessment of the future by the agents in the prelim group should not have an effect on the assessment of the past by the agents in the pa group, other than what can be explained by the prelim group's assessment of the past. This corresponds with the hypothesis $\boldsymbol{\gamma} = \mathbf{0}$, which we test against $\boldsymbol{\gamma} \neq \mathbf{0}$ by t- and F-tests. If $PAGO_t^{\text{prelim}}$ is an unbiased predictor of $PAGO_t^{\text{final}}$, it should also be an unbiased predictor of $PAGO_t^{\text{pa}}$, which implies $\alpha = 0, \beta = 1$ and $\boldsymbol{\gamma} = 0$. We test this hypothesis against the two sided alternative also by an F-test.

The prelim and pa subsamples may exhibit structural differences. The Michigan survey aims at a representative sample over the complete month, so they may target specific groups that are under represented in the first part of the month. From January 2000 onward, demographic characteristics related to age, family composition, education and financial position are available. For each month, we calculate the weighted average value of a characteristic, or the frequency of a particular answer. We split the observations into those belonging to the prelim-period and to the pa-period. We use the differences, calculated as the pa-values minus the prelim-values as the control variates in Equation (7). We provide details and summary statistics of the demographic variables in Appendix A.2.

5.2 Results

Table 8 presents our results of the regressions of post-announcement values of PAGO on the preliminary values of the different forward-looking variables. Panel (a) shows that the pa respondents' assessments of past changes in their financial position are positively related to the prelim respondents' expectations about changes in their personal financial position over the year to come. In the regression without covariates, a one point increase in $PEXP_t^{\text{prelim}}$ leads to an increase of 0.20 in $PAGO_t^{\text{pa}}$. This increase is significant at the 5% level. The test that $PAGO_t^{\text{prelim}}$ is an unbiased predictor of $PAGO_t^{\text{np}}$ leads to a Wald statistic of 8.96, with a p-value below 0.1%.

[Table 8 about here.]

[Table 8 (continued) about here.]

We show in Appendix A.2 that the pa-respondents differ from the prelim-respondents with respect to most demographic characteristics. For example, pa-respondents are about 4 years younger and earn about $ 2,650 more. These differences may contaminate our regression results. We therefore include the differences between the weighted average values for the prelim and pa respondents for each demographic variable as control variates in our regressions to account for these differences in subsample composition. We find that the differences in age, end grade (highest grade completed) and income have a significant effect on $PAGO_t^{\text{pa}}$, while the other characteristics are mostly insignificant (see the full results in Appendix C). Correcting for differences in age, end grade or income, the effect of $PEXP_t^{\text{prelim}}$ becomes stronger and more significant. The same holds when we correct for all three of them. The Wald statistics also still reject that $PAGO_t^{\text{prelim}}$ is an unbiased predictor at the 5% significance level.

Table 8b shows that $PAGO_t^{\text{pa}}$ is also positively related to the preliminary expectations about the development of business conditions for the next year, measured by BUS1Y. However, the effect is about half of what we observe for PEXP with coefficients around 0.12, and significance levels of 5%. Of course, the conceptual differences between the BUS1Y and PAGO questions are larger than between PAGO and PEXP. PAGO and PEXP both concern a respondent's financial position, PAGO the past yearly change and PEXP the future yearly change. The link between the development in business conditions and changes in ones personal financial position are clearly weaker. The Wald tests indicate support against $PAGO_t^{\text{prelim}}$ being an unbiased predictor, though sometimes only at the 10% level.

The results when using the 5-year expectations regarding business conditions BUS5Y in Table 8c are a bit weaker than those based on the 1-year expectations. Coefficients are a bit smaller, varying between 0.08 and 0.10 compared to 0.10 to 0.13 for BUS1Y, and sometimes only significant at the 10% level. The Wald tests show that the unbiasedness of $PAGO_t^{\text{prelim}}$ as a predictor of $PAGO_t^{\text{pa}}$ is still mostly rejected. However, when age is included, in particular as only control, the coefficient of BUS5Y is not significant anymore, and the Wald test does not reject. This difference may be explained by 5-year expectations being conceptually more removed from past changes in financial positions than 1-year expectations.

In Table 8d we show how the three forward looking variables together are related to $PAGO_t^{\text{pa}}$. The effect of PEXP is strongest, but interestingly BUS1Y has positive and significant coefficients as well. Both are similar to those in Table 8a and mostly significant at the 5 level. The coefficients for BUS5Y change sign and have large standard errors, indicating that BUS5Y does not contribute much compared to PEXP and BUS1Y. However, the Wald2-tests reject zero coefficients for the forward looking variables with p-values lower than 5%. We reject that $PAGO_t^{\text{prelim}}$ is an unbiased predictor of $PAGO_t^{\text{pa}}$, as the p-values for Wald1 are all below 0.1%, or below 5 and 10% when correcting for age differences.

We conclude that we find evidence for irrational herding, as our results show that the assessment of the future of the group of early respondents is positively related to assessment of the past by the group of late respondents. This positive relation goes beyond what can be explained by the assessment of the past by this first group. The effect is stronger, when the assessment about the future is conceptually more related to the assessment of the past. When we correct for structural differences in the composition of the groups, these results do not disappear, but become stronger.

We acknowledge that we cannot be sure that the prelim values are actually known by the post-announcement respondents. It is a generally accepted issue in real-world econometric inference that one can never be sure of the information sets that agents use to form assessments and expectations. Our results indicate that the assessment of the past by the prelim respondents has high explanatory power for the same assessment by the pa respondents. In the rational system 2, it should be a perfect predictor, in particular when accounting for structural differences in sample composition. But that is not what we find, as we additionally find a significant and economically relevant effect from assessments about the future on assessments about the past. We do not interpret that as herding in the strict sense that the pa respondents track the prelim ones, but more loosely in the sense that the pa respondents pay more attention to the assessment of the future by others, of which we take the prelim values as representative, than they should.

5.3 Feedback loop

The system-1 channel with which future expectations influence assessments of the past give rise to a feedback loop. Suppose that the prelim-respondents become more positive about the future, for example because they receive good news. Of course, this good news will also make the pa-respondents more positive about the future. However, because of the herding effect that we find, the pa-respondents will also become more positive about the past. So, we will see a knock-on effect on consumer confidence as a whole. Respondents in the next period will include this information in their assessments of the past and the future, which will then also rise more than what could be expected purely in system 2.

To gauge the impact of the feedback loop, we set up a specific impulse response analysis in a VAR-setting. We use a standard VAR(1) to model the joint evolution of the final values of PAGO and the k forward looking variables $\boldsymbol{x}_t$,

$$\boldsymbol{y}_{t+1} = \boldsymbol{\psi} + \boldsymbol{\Phi}\boldsymbol{y}_t + \boldsymbol{\eta}_{t+1}, \quad \boldsymbol{\eta} \sim \mathrm{N}(\mathbf{0}, \boldsymbol{\Sigma}), \tag{8}$$

where $\boldsymbol{y}_t = (PAGO_t^{\text{final}}, (\boldsymbol{x}_t^{\text{final}})')'$, $\boldsymbol{\psi}$ is a vector of size $k+1$, $\boldsymbol{\Phi}$ is a square matrix of size $k+1$.

The final values are a weighted sum of the prelim and pa values,

$$\begin{pmatrix} PAGO_t^{\text{final}} \\ \boldsymbol{x}_t^{\text{final}} \end{pmatrix} = (1 - w_t) \begin{pmatrix} PAGO_t^{\text{prelim}} \\ \boldsymbol{x}_t^{\text{prelim}} \end{pmatrix} + w_t \begin{pmatrix} PAGO_t^{\text{pa}} \\ \boldsymbol{x}_t^{\text{pa}} \end{pmatrix}, \tag{9}$$

where w_t gives the proportion of pa-respondents in month t.

We assume that a shock $\Delta\boldsymbol{x}_t^{\text{prelim}}$ occurs in the prelim values of the forward looking variable $\boldsymbol{x}$ at time t, which is added to the conditional expectation based on the information at time $t-1$, $\boldsymbol{x}_t = \mathrm{E}\big[\boldsymbol{x}_t^{\text{prelim}}|\boldsymbol{y}_{t-1}\big] + \Delta\boldsymbol{x}_t^{\text{prelim}}$. The prelim value of PAGO does not encounter a shock, $\Delta PAGO_t^{\text{prelim}} = 0$, so $PAGO_t^{\text{prelim}} = E\big[PAGO_t^{\text{prelim}}|\boldsymbol{y}_{t-1}\big]$. Following the standard approach for VAR models (see Lütkepohl, 2005; Koop et al., 1996), we define the impulse response function of the VAR to this shock for horizon h as

$$\begin{aligned} IR(h, \Delta\boldsymbol{x}_t^{\text{prelim}}, \boldsymbol{y}_{t-1}) &= \mathrm{E}[\boldsymbol{y}_{t+h}|\Delta\boldsymbol{x}_t^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}} = 0, \boldsymbol{y}_{t-1}] - \mathrm{E}[\boldsymbol{y}_{t+h}|\boldsymbol{y}_{t-1}] \\ &= \boldsymbol{\Phi}^h\big(\mathrm{E}[\boldsymbol{y}_t|\Delta\boldsymbol{x}_t^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}} = 0, \boldsymbol{y}_{t-1}] - \mathrm{E}[\boldsymbol{y}_t|\boldsymbol{y}_{t-1}]\big). \end{aligned} \tag{10}$$

The first term in this multiplication captures the propagation of the shock h months forward. The second term captures the effect of the shock in the prelim-values on the final values at the end of the month.

Our interest focuses on the second term, because the expectation conditional on the shock, $\mathrm{E}[\boldsymbol{y}_{t+h}|\Delta\boldsymbol{x}_t^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}} = 0, \boldsymbol{y}_{t-1}]$, depends on the system in which they are evaluated (which we will denote by subscripts S1 and S2). In both systems, the pa-respondents will update their expectations because of the shock. We assume that the updating follows from the standard multivariate linear model, which is an extension of Equation (7),

$$PAGO_t^{\text{pa}} = \alpha_1 + \beta_1 PAGO_t^{\text{prelim}} + \boldsymbol{\gamma}_1'\boldsymbol{x}_t^{\text{prelim}} + \boldsymbol{\delta}_1'\boldsymbol{z}_t + \varepsilon_{1,t} \tag{11}$$

$$\boldsymbol{x}_t^{\text{pa}} = \boldsymbol{\alpha}_2 + \boldsymbol{\beta}_2 PAGO_t^{\text{prelim}} + \boldsymbol{\gamma}_2\boldsymbol{x}_t^{\text{prelim}} + \boldsymbol{\delta}_2\boldsymbol{z}_t + \boldsymbol{\varepsilon}_{2,t}, \tag{12}$$

where $\boldsymbol{\alpha}_2$ and $\boldsymbol{\beta}_2$ are vectors of size k, $\boldsymbol{\gamma}_2$ is a $k \times k$ matrix, and $\boldsymbol{\delta}_2$ a $k \times m$ matrix that gives the effect of the covariates. In system 2, the restriction $\boldsymbol{\gamma}_1 = \boldsymbol{0}$ applies, contrary to system 1. Because the forward looking variables $\boldsymbol{x}_t^{\text{pa}}$ can be rationally influenced by both $PAGO_t^{\text{prelim}}$ and $\boldsymbol{x}_t^{\text{prelim}}$, there are no coefficient restrictions in Equation (12) in either system 1 or 2.

The expected effect of the shock on $PAGO_t^{\text{pa}}$ in system 1 follows from Equation (11) as

$$\mathrm{E}_{\text{S1}}\big[PAGO_t^{\text{pa}}|\Delta\boldsymbol{x}_t^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}} = 0, \boldsymbol{y}_{t-1}\big] - \mathrm{E}_{\text{S1}}\big[PAGO_t^{\text{pa}}|\boldsymbol{y}_{t-1}\big] = \boldsymbol{\gamma}_1'\Delta\boldsymbol{x}_t^{\text{prelim}}. \tag{13}$$

Because $\boldsymbol{\gamma}_1 = 0$ in system 2, the expected effect in system 2 is zero,

$$\mathrm{E}_{\text{S2}}\big[PAGO_t^{\text{pa}}|\Delta\boldsymbol{x}_t^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}} = 0, \boldsymbol{y}_{t-1}\big] - \mathrm{E}_{\text{S2}}\big[PAGO_t^{\text{pa}}|\boldsymbol{y}_{t-1}\big] = 0. \tag{14}$$

In both systems, the effect on $\boldsymbol{x}_t^{\text{pa}}$ is given by

$$\begin{aligned}
&\mathrm{E}_{\mathrm{S1}}\left[\boldsymbol{x}_t^{\text{pa}}|\Delta\boldsymbol{x}_t^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}}=0, \boldsymbol{y}_{t-1}\right] - \mathrm{E}_{\mathrm{S1}}\left[\boldsymbol{x}_t^{\text{pa}}|\boldsymbol{y}_{t-1}\right] = \\
&\mathrm{E}_{\mathrm{S2}}\left[\boldsymbol{x}_t^{\text{pa}}|\Delta\boldsymbol{x}_t^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}}=0, \boldsymbol{y}_{t-1}\right] - \mathrm{E}_{\mathrm{S2}}\left[\boldsymbol{x}_t^{\text{pa}}|\boldsymbol{y}_{t-1}\right] = \gamma_2\Delta\boldsymbol{x}_t^{\text{prelim}}.
\end{aligned} \tag{15}$$

With Equation (9) the effect on the final values can be calculated.

We first investigate the feedback loop when the loop runs via only one of the forward-looking variables. We report the estimated coefficients of Equations (8) and (12) in Tables C.3 and C.4 in Appendix C. In Figure 2 we show how a shock of 1 in one of the forward looking variables impacts PAGO from the month of the shock ($h = 0$) up to 60 months in the future ($h = 60$). Because the weights of the prelim versus pa-respondents varies over time, we use its average value in Equation (9). The dotted lines in panels (a–c) give the effect that the shock has in system 2. Because of the restriction in Equation (14), the effect starts at zero, but becomes positive in the next month. For all three variables, peaks of about 0.26 (PEXP and BUS1Y), and 0.23 (BUS5Y) are reached after about 6 months. Thereafter, the shocks slowly die out. The solid lines lie above the dotted line and show the knock-on effect that the shock has in system 1. Following Equations (9) and (13), the lines start above zero because the γ_1-coefficients reported in the first column of each panel of Table 8 are positive. The shock then propagates through the system and reaches maxima of 0.30 (PEXP), 0.28 (BUS1Y) and 0.25 (BUS5Y). Though these effects may seem small, we show in panel d that the increase of the impact of the shock in system 1 relative to system 2 is sizable, in particular in the first months. Shocks in PEXP have an effect that is more than 15% stronger in the first six months. As we also show in Table 8, the effects of shocks in BUS1Y and BUS5Y are smaller, but still exceed 6-7% over that horizon.

[Figure 2 about here.]

Next, we turn to the feedback loop when the effect can run via the three forward-looking variables combined. Our impulse response analysis differs slightly from the previous one, as we need to take into account that shocks to the three variables are correlated. Although it is possible to determine how a shock to, say, $BUS1Y1Y_t^{\text{prelim}}$ only propagates through the system under the assumption that $PEXP_t^{\text{prelim}}$ and $BUS1Y5Y_t^{\text{prelim}}$ do not encounter a shock, that situation is not very realistic. Instead, we follow the framework of Koop et al. (1996) and determine for a given shock in forward-looking variable i, the expected shock in the other two forward-looking variables,

$$\begin{aligned}
&\mathrm{E}[\Delta\boldsymbol{x}_t|\Delta x_{it}^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}}=0, \boldsymbol{y}_{t-1}] \\
&= \mathrm{E}[\boldsymbol{x}_t^{\text{prelim}}|\Delta x_{it}^{\text{prelim}}, \Delta PAGO_t^{\text{prelim}}=0, \boldsymbol{y}_{t-1}] - \mathrm{E}[\boldsymbol{x}_t^{\text{prelim}}|\boldsymbol{y}_{t-1}],
\end{aligned} \tag{16}$$

and then determine the propagation of the shocks through the system. We again use a standard linear model to determine the relation between $\boldsymbol{x}_t$ on $\boldsymbol{y}_{t-1}$ with the assumption of normally distributed error terms. We use the covariance matrix of the error terms to determine the expected shocks in Equation (16). We report the estimation results in Table C.5.

The results of this impulse response analysis in Figure 3 confirm our results for the bivariate analyses. The impulse responses are generally a bit smaller, and the same holds for the difference between system 1 and system 2. Table 8d also shows that the herding effect is less clear-cut when it can run via PEXP, BUS1Y and BUS5Y combined. Still, Figure 3d shows that the impact of a shock in system 1 relative to system 2 is more than 10% stronger in the first six months for PEXP, and more than 5% for BUS1Y and BUS5Y for that horizon. So, also this analysis shows how herding in system 1 can produce a feedback loop.

[Figure 3 about here.]

5.4 Robustness checks

5.4.1 Analysis with first differences

We show in Appendix A that all sentiment variables exhibit a high degree of persistence. This near unit-root behavior may lead to spurious regression results in our analysis so far. Therefore, we repeat our tests for changes in the different variables,

$$\Delta PAGO_t^{\text{pa}} = \alpha + \beta \Delta PAGO_t^{\text{prelim}} + \boldsymbol{\gamma}' \Delta \boldsymbol{x}_t^{\text{prelim}} + \boldsymbol{\delta}' \boldsymbol{z}_t + \varepsilon_t, \quad \varepsilon_t \sim \text{N}(0, \sigma^2). \tag{17}$$

For both the dependent and the explanatory sentiment variables we take the difference with respect to the final value of that variable in the previous period, which we denote with the Δ-operator in front of them. In system 2 we still expect $\boldsymbol{\gamma} = 0$. We also test whether $\Delta PAGO_t^{\text{prelim}}$ is an unbiased predictor of $\Delta PAGO_t^{\text{pa}}$.

Our results for changes in PEXP in Table 9a confirm the results in Table 8a. We reject the hypothesis $\gamma = 0$ for all regressions in which $\Delta PAGO_t^{\text{pa}}$ is the dependent variable. The inclusion of covariates does not change this result. For all series we reject that $\Delta PAGO_t^{\text{prelim}}$ is an unbiased predictor of $\Delta PAGO_t^{\text{pa}}$. These results mean that also when we concentrate on changes, we find that the increased optimism of one group of respondents about their future financial position spills over into the assessment by another group about their past financial position, .

[Table 9 about here.]

[Table 9 (continued) about here.]

The results for BUS1Y and BUS5Y in Table 9b and c show that we do not find this effect for changes in expectations about business conditions. The coefficients for $\Delta BUS1Y^{\text{prelim}}$ and $\Delta BUS5Y^{\text{prelim}}$ are smaller and insignificant. In Table 8, the effects of BUS1Y and BUS5Y were also weaker than for PEXP, but mostly (marginally) significant. We reject the hypothesis that $\Delta PAGO_t^{\text{prelim}}$ is an unbiased predictor of $\Delta PAGO_t^{\text{pa}}$, but this is largely driven by the estimates for the intercept and $\Delta PAGO_t^{\text{prelim}}$.

When we include the changes in all three forward-looking sentiment variables in the regression (Table 9d) the coefficient of $\Delta PEXP^{\text{prelim}}$ is large and significant, whereas the coefficients for $\Delta BUS1Y^{\text{prelim}}$ and $\Delta BUS5Y^{\text{prelim}}$ are again insignificant. These results do not change when covariates are included. Moreover, the results for the joint test $\boldsymbol{\gamma} = \mathbf{0}$ (reported in the row "Wald2") further support the relation from future expectations to past assessments. Also here we reject that $\Delta PAGO_t^{\text{prelim}}$ is an unbiased predictor.

We conclude that the result we report in Table 8 are not spurious. Also when we conduct the analysis based on changes, we find that future expectations of one group influence the past assessment of another group about their financial position, on top of what could be expected based the past assessments of this first group. This result holds in particular when the future expectation is also about the financial position. The influence is weaker when expectations about business conditions are considered.

5.4.2 Analysis with state variables

One could argue that the assumption of $PAGO_t^{\text{prelim}}$ being a perfect predictor of $PAGO_t^{\text{pa}}$ is too strong. The number of pa-respondents is small (typically around 160), and we document structural differences between the two groups in Appendix A.2. If the information sets that these two groups of respondents use to answer the PAGO-question differ, the inclusion of the differences in demographic characteristics as control variables may not be sufficient. If the same information sets are also used to assess the future, the forward looking variables of the prelim group can contain useful information for backward looking PAGO variable of the pa group, because they reflect differences between the information sets.

We investigate this line of reasoning as follows. Our results in Section 4 show that past changes in several of the financial and macro variables have high explanatory power with regard to PAGO, so together they form a relevant information set. Moreover, because of the autoregressive nature of these variables, they are also relevant for predictions, so also for the forward looking variables. We therefore include all these changes as predictors in Equation (7). If the significance of the forward looking variables of the prelim group is due to the omission of financial and macro variables, the first should lose their significance when the latter are included. Because our analyses in Section 4 shows that the explanatory power of the peak rule applied to the changes is higher than the rational rule (so the actual yearly changes), we also include the best performing peak rule in the regressions.

[Table 10 about here.]

[Table 10 (continued) about here.]

[Table 10 (continued) about here.]

[Table 10 (continued) about here.]

Our results in Table 10 show that the forward looking prelim variables remain significant after inclusion of either the past changes under the rational rule or the best performing peak rule. Comparing the results for PEXP in Table 10a with Table 8a actually shows that the effect of PEXP becomes stronger instead of weaker, with coefficients that increase from about 0.20–0.23 to 0.34–0.47. The inclusion of demographic differences does not lead to a different outcome. Of the financial and macro variables, 3 to 6 have significant coefficients, indicating that they are relevant for predicting $PAGO_t^{\mathrm{pa}}$. Most relevant are the growth in the house price index and non-farm payrolls. Since the macro and financial variables predict $PAGO_t^{\mathrm{prelim}}$ as well, the coefficient for $PAGO_t^{\mathrm{prelim}}$ itself goes down compared to Table 8a. In line with our results in Section 4, the changes under the peak rule are more informative as indicated by the higher adjusted R^2, but the increase is small, also when compared to Table 8a.

The results for BUS1Y and BUS5Y in panels b and c paint a similar picture. Their coefficients remain significant after inclusion of the predictor variables, and show a moderate increase from around 0.12 to 0.14 and 0.09 to 0.12. The results are not sensitive to the inclusion of the control variables or the choice between the rational or peak rule. The peak rule leads again to a slightly higher adjusted R^2. Also here, the coefficients for $PAGO_t^{\mathrm{prelim}}$ go down to similar values as in panel a.

Analyzing the three forward looking variables jointly in Table 10d shows some more differences compared to Table 8d. The coefficients for PEXP show again a moderate increase, though not as strong as before, whereas the coefficients for BUS1Y and BUS5Y are similar. However, in each regression, only one of the forward looking variables has a significant coefficient, either PEXP or BUS1Y. In Table 8d, both of them are. The hypothesis that the three coefficients are jointly zero is clearly rejected in case peak rules are applied, and marginally rejected in case the rational rule is used. The large number of explanatory variables may explain this difference. We also see some more variation in the coefficients depending on the inclusion of control variates or the choice between the rational or peak rule.

We conclude from this analysis that the predictive effect from the forward looking prelim variables to the backward looking $PAGO_t^{\mathrm{pa}}$ cannot be explained by the omission of predictive financial and macro variables from the regressions reported in Table 8. Instead of disappearing or weakening, the predictive effect remains and mostly become stronger after their inclusion. Because these variables cover broad aspects of the financial and macroeconomic situation, we maintain our conclusion of herding in the sense that the pa-respondents pay too much attention to assessments of the future by the prelim-respondents when forming their own assessments of the past.

6 Conclusion

In this paper we show the presence of effects of the the peak-end rule and herding in the Index of Consumer Sentiment of the University of Michigan. First, respondents relate the change in their financial position over the last year more to detrimental extremes in financial and macroeconomic state variables than to the total monthly changes. We rule out that the explanatory power of the extremes stems from the risk aversion of the respondents. Second, respondents' assessment of past changes can be predicted by the expectation about future changes of other respondents that are interviewed earlier beyond how these respondents assessed past changes. The predictability by expected future changes increases when we correct for systematic demographic differences between the groups of respondents.

The biases we find can be understood in the judgmental framework of Tversky and Kahneman (1974) where agents make quick intuitive judgments under system 1, instead of more reasoned ones under system 2. Our first finding provides evidence of the peak part of the peak-end rule, though we find no evidence of the end-part. Instead of a detailed consideration of changes in their financial position, agents use the peak-end rule as a heuristic, where in our case the worst change is substituted for the total change. The second finding is a form of irrational herding. This result can be interpreted as the anchoring heuristic of system 1.

Our findings show that these cognitive biases are not restricted to individual behavior, but also affect an important economic indicator such as the ICS. They complement earlier findings of the peak-end rule and herding that were confined to more controlled or even laboratory settings. As a second contribution, we argue that the presence of a subjective behavioral component can explain why indexes of consumer sentiment constitute an important economic indicator next to more objectively defined macro variables. Other explanations state that they contain news that is not yet present in other macro variables or that they capture sudden changes in the preferences of consumers. Instead, their added value may stem from measuring how cognitive biases systematically impact the judgments of consumers about the economy, and consequently their actions.

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Table 1: Summary statistics for ICS and its constituting variables

(a) Marginal distribution

	ICS	PAGO	PEXP	BUS	BUS5Y	DUR
Mean	86.1	108.4	122.1	101.1	91.1	145.1
Median	89.4	111.0	124.0	105.0	93.0	151.0
Minimum	51.7	58.0	90.0	31.0	40.0	77.0
	May-80	Aug-09	Apr-79	May-80	Jul-79	May-80
Maximum	112.0	142.0	145.0	165.0	136.0	182.0
	Jan-00	Feb-98	Feb-98	Jan-00	Feb-00	May-99
Standard Deviation	12.53	16.95	10.45	28.43	17.66	20.13

(b) Correlation

	ICS	PAGO	PEXP	BUS	BUS5Y	DUR
ICS	1					
PAGO	0.90	1				
PEXP	0.87	0.77	1			
BUS	0.96	0.80	0.79	1		
BUS5Y	0.91	0.74	0.83	0.87	1	
DUR	0.88	0.79	0.67	0.79	0.69	1

This table gives summary statistics for the ICS and its constituting series. Below the minimum and maximum values for the different series, we report the date of occurrence. The sample period is from January 1978 to September 2021 (525 months).

Table 2: Tests Results of the Best Performing Peak Rules applied to Financial Variables

variable	period	ra	R^2	rule	r	R^2	ra	r	R^2	ra	r	vol.	R^2
S&P500	1	0.11	0.01	mp	0.18	0.01	0.06	0.11	0.00	0.17	−0.07	0.30	0.00
		(0.17)			(0.26)		(0.32)	(0.49)		(0.32)	(0.49)	(0.65)	
	2	0.32***	0.21	mp	0.66***	0.27	0.12	0.50**	0.27	0.53***	−0.20	1.09***	0.39
		(0.08)			(0.15)		(0.12)	(0.22)		(0.16)	(0.30)	(0.36)	
	3	0.55***	0.17	mt	0.94***	0.33	−0.22	1.17***	0.34	−0.30	1.40**	0.37	0.34
		(0.17)			(0.11)		(0.38)	(0.39)		(0.37)	(0.62)	(1.14)	
BAMLCC	1	0.36	0.06	st	3.17***	0.25	0.12	2.97***	0.25	0.23	1.26	−0.88	0.26
		(0.30)			(0.91)		(0.23)	(1.02)		(0.26)	(2.18)	(0.92)	
	2	−0.56	0.07	mp	−0.78*	0.09	0.42	−1.27	0.09	0.62	−1.51	0.64	0.09
		(0.38)			(0.45)		(0.74)	(0.94)		(0.75)	(0.95)	(1.97)	
	3	−0.29	0.00	sp	−13.91***	0.26	0.64	−15.89***	0.28	0.13	−9.91	−1.91	0.29
		(1.01)			(3.43)		(0.55)	(3.08)		(0.61)	(6.23)	(1.80)	
UST3M	1	−0.25	0.00	sp	−11.61***	0.44	0.71	−12.18***	0.45	0.68	−11.89*	−0.13	0.45
		(1.08)			(2.20)		(0.72)	(2.05)		(0.72)	(6.60)	(2.47)	
	2	1.88*	0.05	mt	3.21**	0.06	0.16	2.99	0.06	−1.70	9.71	22.91*	0.15
		(1.10)			(1.37)		(2.86)	(4.02)		(3.08)	(6.06)	(11.72)	
	3	10.34***	0.24	mt	8.97**	0.14	27.98***	−20.41**	0.30	26.00***	−11.69	15.98	0.31
		(3.29)			(3.66)		(8.06)	(10.08)		(7.68)	(11.06)	(17.46)	
UST10Y	1	−1.79	0.05	sp	−16.31***	0.19	−0.44	−15.37**	0.19	−1.58	−1.55	−7.36	0.21
		(1.56)			(5.29)		(1.36)	(6.12)		(1.46)	(13.60)	(6.21)	
	2	2.00	0.03	mt	4.11	0.03	1.10	2.12	0.02	1.41	1.49	−1.89	0.02
		(2.10)			(3.64)		(3.22)	(4.53)		(3.23)	(4.93)	(12.53)	
	3	6.71	0.04	st	49.61***	0.33	−6.01	60.10***	0.35	4.90	−50.31**	−105.04***	0.54
		(5.86)			(7.90)		(5.70)	(9.31)		(4.35)	(22.80)	(22.04)	
HPIQ	1	−0.32	0.00	sp	−4.85**	0.15	1.96***	−9.49***	0.25	1.01	−5.78	−2.66	0.26
		(0.70)			(1.91)		(0.70)	(2.73)		(0.99)	(4.74)	(2.73)	
	2	0.11	−0.01	mt	2.02	0.01	−2.76	12.65	0.06	3.57	−10.27	−14.73**	0.11
		(0.54)			(2.61)		(1.75)	(8.26)		(2.62)	(10.16)	(7.29)	
	3	3.72***	0.68	st	12.08***	0.75	0.13	11.69***	0.75	2.03*	3.59	−5.92**	0.76
		(0.60)			(1.11)		(1.23)	(3.60)		(1.09)	(4.10)	(2.66)	

This table shows the results of the peak rules that perform best in regressions of $PAGO_t$ on changes of financial variables over the past year for three subperiods. For each variable and subperiod, we report the single regression with the rational rule, the single regression with the best performing peak rule, the multiple regression with both rules, and the multiple regression with both rules and the volatility of the explanatory variable over the past year. The best performing peak rule has the highest R^2 in a single regression. The abbreviations stand for ra: rational; sp: single peak; mp: multi-period peak; st: single trough; mt: multi-period trough. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. Superscripts ***,**,* indicate significance at the 1%, 5% and 10% level. The columns "R^2" give the adjusted R^2. The subperiods are from January 1978 to June 1992 ($T = 174$), July 1992 to December 2006 ($T = 174$) and January 2007 to September 2021 ($T = 177$). The results for each rule are reported in Table B.4.

Table 3: Tests Results of the Best Performing Peak Rules applied to Macroeconomic Variables

variable	period	ra	R^2	rule	r	R^2	ra	r	R^2	ra	r	vol.	R^2
CPI	1	−3.25***	0.55	sp	−31.85***	0.62	−1.09	−23.07***	0.63	−2.02	−11.70	−6.97	0.64
		(0.35)			(3.89)		(0.82)	(8.64)		(1.22)	(13.03)	(6.32)	
	2	−2.79	0.03	mt	12.68*	0.06	−3.39	14.23*	0.10	−9.60***	53.21***	29.44**	0.21
		(3.12)			(7.12)		(2.60)	(8.44)		(3.49)	(19.28)	(12.26)	
	3	−0.11	−0.01	sp	−73.07***	0.37	2.57	−77.58***	0.39	1.92	−71.03*	−2.74	0.39
		(3.66)			(12.58)		(2.08)	(12.29)		(5.14)	(39.89)	(15.43)	
GNP	1	−0.86	0.02	sp	−1.99	0.02	−0.52	−1.01	0.02	−0.74	0.17	−1.31	0.02
		(0.95)			(1.73)		(1.78)	(3.62)		(1.70)	(4.01)	(3.40)	
	2	2.48***	0.19	mp	2.56***	0.19	5.12	−2.75	0.19	7.07	−4.91	0.84	0.19
		(0.42)			(0.45)		(7.12)	(7.62)		(5.55)	(5.96)	(1.73)	
	3	1.69	0.04	mp	3.81**	0.12	0.93	3.45**	0.12	−3.12	9.17	−3.88	0.13
		(1.80)			(1.85)		(1.22)	(1.43)		(6.23)	(9.54)	(6.13)	
NFP	1	2.74***	0.17	mp	3.73**	0.14	4.36	−2.47	0.17	4.09	−2.06	−2.28	0.16
		(0.90)			(1.44)		(2.90)	(4.68)		(3.39)	(5.40)	(11.26)	
	2	4.82***	0.33	mp	6.13***	0.33	4.11	0.92	0.33	0.37	6.20	−14.17**	0.39
		(1.20)			(1.71)		(4.65)	(6.85)		(5.59)	(8.44)	(6.10)	
	3	2.30	0.10	mp	4.35*	0.13	2.59**	4.77**	0.26	7.71***	−3.73	6.22*	0.30
		(1.74)			(2.37)		(1.23)	(1.92)		(2.86)	(6.15)	(3.71)	
UNEMP	1	−7.46***	0.39	mp	−11.65***	0.36	−5.17**	−4.23	0.40	−9.03***	6.31	−23.92***	0.46
		(1.07)			(2.01)		(2.61)	(4.68)		(3.20)	(6.92)	(8.74)	
	2	−6.50***	0.12	sp	−53.95***	0.24	−0.51	−51.87***	0.24	0.26	−65.47***	10.39	0.24
		(2.21)			(15.86)		(2.65)	(18.39)		(2.82)	(23.78)	(14.52)	
	3	−2.85	0.07	mt	−1.91	0.02	−2.86	−1.92	0.09	−15.79***	19.79***	18.42***	0.35
		(2.21)			(1.23)		(2.03)	(1.20)		(2.62)	(3.81)	(2.95)	
PCE	1	1.13	0.03	sp	6.05**	0.11	−0.33	6.64	0.11	−0.24	5.61	1.27	0.10
		(1.45)			(2.34)		(2.08)	(5.09)		(2.13)	(5.82)	(3.09)	
	2	3.31***	0.19	mp	3.30***	0.16	6.79***	−3.78*	0.19	1.63	1.94	−5.39	0.25
		(0.83)			(0.89)		(2.09)	(2.15)		(3.59)	(3.91)	(3.50)	
	3	1.38	0.05	mp	1.07**	0.04	1.20	0.90**	0.07	−0.79	3.90	−2.94	0.07
		(1.02)			(0.52)		(0.92)	(0.45)		(3.92)	(5.54)	(5.69)	

This table shows the results of the peak rules that perform best in regressions of $PAGO_t$ on changes of macro variables over the past year for three subperiods. See Table 2 for further explanations. The results for each rule are reported in Table B.5. The first subperiod for the regressions with PCE start in January 1981.

Table 4: Test Results of the End Rule applied to Financial Variables

(a) S&P500

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	0.11		0.12	0.32***		0.35***	0.55***		0.55***
	(0.17)		(0.18)	(0.08)		(0.08)	(0.17)		(0.17)
g^{end}		0.04	−0.04		0.19	−0.29**		0.61	0.01
		(0.17)	(0.17)		(0.17)	(0.12)		(0.53)	(0.29)
R^2	0.01	−0.01	0.00	0.21	0.00	0.21	0.17	0.01	0.17

(b) BAMLCC

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	0.36		0.41	−0.56		−0.56	−0.29		−0.24
	(0.30)		(0.32)	(0.38)		(0.38)	(1.01)		(1.01)
g^{end}		0.08	−0.53		−0.86	−0.08		−1.00	−0.79
		(0.54)	(0.49)		(0.83)	(0.66)		(2.10)	(1.87)
R^2	0.06	−0.01	0.07	0.07	0.00	0.06	0.00	0.00	0.00

(c) UST3M

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	−0.25		−0.37	1.88*		1.96*	10.34***		11.92***
	(1.08)		(1.10)	(1.10)		(1.15)	(3.29)		(3.50)
g^{end}		0.99	1.35		6.36	−1.20		13.57	−20.16**
		(1.59)	(1.33)		(5.88)	(5.06)		(15.07)	(8.85)
R^2	0.00	0.00	0.00	0.05	0.01	0.05	0.24	0.01	0.25

(d) UST10Y

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	−1.79		−1.98	2.00		2.01	6.71		6.91
	(1.56)		(1.64)	(2.10)		(2.12)	(5.86)		(5.86)
g^{end}		−0.66	2.33		2.46	−0.06		3.86	−2.70
		(3.11)	(2.74)		(4.11)	(3.46)		(9.09)	(8.01)
R^2	0.05	−0.01	0.05	0.03	0.00	0.02	0.04	0.00	0.04

(e) HPIQ

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	−0.32		−0.53	0.11		−0.63	3.72***		5.15***
	(0.70)		(1.04)	(0.54)		(0.75)	(0.60)		(0.43)
g^{end}		−0.24	0.90		1.32	3.10		8.09***	−5.04***
		(1.48)	(2.19)		(1.55)	(2.06)		(1.90)	(1.74)
R^2	0.00	−0.01	0.00	−0.01	0.00	0.00	0.68	0.36	0.72

This table shows the results of the end rule in regressions of $PAGO_t$ on changes of financial variables over the past year for three subperiods. The rows g^{ra} and g^{end} contains the coefficient estimates for the rational rule of Equation (3) and the end rule in Equation (5). For each variable and subperiod, we report the single regression with the rational rule, the single regression with the end rule and the multiple regression with both rules. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. Superscripts ***,**,* indicate significance at the 1%, 5% and 10% level. The row "R^2" gives the adjusted R^2.

Table 5: Test Results of the End Rule applied to Macro Variables

(a) CPI

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	-3.25^{***}		-3.36^{***}	-2.79		-2.80	-0.11		-0.59
	(0.35)		(0.42)	(3.12)		(3.40)	(3.66)		(3.99)
g^{end}		-20.71^{***}	1.35		-3.32	0.04		6.44	7.08
		(5.10)	(3.53)		(4.19)	(4.47)		(5.70)	(6.44)
R^2	0.55	0.28	0.55	0.03	0.00	0.02	-0.01	0.00	0.00

(b) GNP

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	-0.86		-1.00	2.48^{***}		2.24^{***}	1.69		1.71
	(0.95)		(1.02)	(0.42)		(0.46)	(1.80)		(1.88)
g^{end}		-1.03	0.62		4.05^{***}	0.94		1.03	-0.05
		(1.73)	(1.63)		(1.25)	(0.93)		(1.30)	(1.10)
R^2	0.02	0.00	0.02	0.19	0.09	0.19	0.04	0.00	0.03

(c) NFP

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	2.74^{***}		2.26^{**}	4.82^{***}		4.70^{***}	2.30		2.33
	(0.90)		(0.97)	(1.20)		(1.27)	(1.74)		(1.79)
g^{end}		15.42^{***}	6.31		20.00^{***}	1.46		1.48	-0.27
		(4.77)	(3.96)		(6.59)	(3.51)		(1.82)	(1.54)
R^2	0.17	0.10	0.17	0.33	0.11	0.33	0.10	0.00	0.10

(d) UNEMP

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	-7.46^{***}		-7.36^{***}	-6.50^{***}		-6.33^{***}	-2.85		-2.89
	(1.07)		(1.09)	(2.21)		(2.38)	(2.21)		(2.26)
g^{end}		-16.75^{***}	-1.18		-9.30^{***}	-2.04		-1.63	0.33
		(4.27)	(3.68)		(3.06)	(3.34)		(2.07)	(1.87)
R^2	0.39	0.07	0.39	0.12	0.01	0.12	0.07	0.00	0.07

(e) PCE

	Jan. 1981 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	1.13		1.17	3.31^{***}		3.40^{***}	1.38		1.38
	(1.45)		(1.48)	(0.83)		(0.83)	(1.02)		(1.05)
g^{end}		0.26	-0.34		1.88	-0.74		0.85	-0.02
		(1.07)	(0.96)		(1.49)	(0.98)		(0.93)	(0.84)
R^2	0.03	-0.01	0.02	0.19	0.00	0.18	0.05	0.00	0.04

This table shows the results of the end rule in regressions of $PAGO_t$ on changes of macro variables over the past year for three subperiods. The rows g^{ra} and g^{end} contains the coefficient estimates for the rational rule of Equation (3) and the end rule in Equation (5). For each variable and subperiod, we report the single regression with the rational rule, the single regression with the end rule and the multiple regression with both rules. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. Superscripts ***,**,* indicate significance at the 1%, 5% and 10% level. The row "R^2" gives the adjusted R^2.

Table 6: Tests Results of the Best Performing Peak Rules for Specific Groups of Respondents

filter	subset	ra	R^2	rule	r	R^2	ra	r	R^2	ra	r	vol.	R^2
A: Stock ownership	all	0.39**	0.11	mt	0.80***	0.28	−0.37	1.20***	0.31	−0.58**	1.87***	1.11	0.33
(S&P500)		(0.20)			(0.14)		(0.31)	(0.33)		(0.27)	(0.40)	(0.78)	
	yes	0.49**	0.15	mt	0.95***	0.33	−0.34	1.33***	0.35	−0.57*	2.04***	1.19	0.37
		(0.21)			(0.13)		(0.33)	(0.35)		(0.29)	(0.46)	(0.85)	
	no	0.18	0.02	mt	0.55***	0.14	−0.51*	1.10***	0.21	−0.76***	1.88***	1.30*	0.24
		(0.20)			(0.16)		(0.28)	(0.30)		(0.24)	(0.38)	(0.76)	
B: Home ownership	all	2.99***	0.57	mt	6.19***	0.66	−0.53	7.16***	0.66	0.36	4.70**	−3.49	0.66
(HPIQ)		(0.41)			(0.40)		(0.73)	(1.42)		(1.02)	(2.24)	(2.43)	
	yes	3.07***	0.54	mt	6.35***	0.62	−0.51	7.27***	0.62	0.34	4.92**	−3.35	0.63
		(0.43)			(0.43)		(0.79)	(1.55)		(1.11)	(2.42)	(2.54)	
	no	2.76***	0.49	mt	5.70***	0.56	−0.34	6.32***	0.55	0.73	3.36	−4.23*	0.56
		(0.37)			(0.39)		(0.71)	(1.39)		(0.92)	(2.09)	(2.38)	
C: Job perspective	all	−3.30	0.08	mp	−1.46	0.03	−4.38	1.10	0.09	4.49***	−21.32***	19.27***	0.29
(UNEMP)		(2.25)			(1.50)		(2.66)	(1.10)		(1.43)	(2.86)	(2.25)	
	0	−2.19	0.04	st	−7.57**	0.02	−2.44	−8.73**	0.07	−9.25***	38.84**	11.87***	0.17
		(2.24)			(3.19)		(1.97)	(4.41)		(2.98)	(15.18)	(3.65)	
	1-49	−4.08*	0.12	mp	−2.14	0.05	−4.65	0.58	0.11	4.22***	−21.85***	19.28***	0.30
		(2.28)			(1.53)		(2.82)	(1.13)		(1.37)	(2.65)	(2.11)	
	50-100	−3.94*	0.10	mp	−2.56*	0.07	−3.34	−0.61	0.10	5.67***	−23.40***	19.59***	0.27
		(2.15)			(1.45)		(2.77)	(1.16)		(1.73)	(3.36)	(2.63)	

This table shows the results of the peak rules that perform best in regressions of $PAGO_t$ constructed based on specific groups of respondents on changes in the S&P500, the housing market index HPIQ and the unemployment rate over the past year. In panel A, we construct PAGO for respondents with and without stock ownership (variable INVEST in the CAB survey). In panel B, we construct PAGO for respondents with and without home ownership (variable HOMEOWN in th CAB survey). In panel C, we group respondents based on the probability (in %) they report for losing their job in the next five years (variable PJOB in the CAB survey). We also report the results for the complete set of respondents. See Table 2 for further explanations. Subperiods run until September 2021 and start in January 2000 for Stock ownership ($T = 260$, May 2003 is missing) and Home ownership ($T = 261$), and December 1997 for Job perspective ($T = 286$). The results for each rule are reported in Tables B.8 to B.10.

Table 7: Tests Results of the Best Performing Peak Rules applied to the Unemployment rate in various regions of the US

region	period	ra	R^2	rule	r	R^2	ra	r	R^2	ra	r	vol.	R^2
South	1	−7.30***	0.32	sp	−63.20***	0.35	−3.27	−40.02	0.36	0.86	−91.51*	37.56	0.37
		(1.20)			(12.60)		(2.21)	(24.88)		(3.90)	(46.73)	(26.92)	
	2	−5.26**	0.05	sp	−39.71***	0.12	−0.56	−37.96***	0.12	−5.82	23.96	−61.37**	0.15
		(2.16)			(10.33)		(2.48)	(11.61)		(4.22)	(30.79)	(29.19)	
	3	−3.55	0.08	sb	−8.96	0.02	−3.74*	−10.27*	0.12	−10.31**	38.44**	11.78**	0.20
		(2.52)			(5.53)		(2.19)	(5.97)		(3.97)	(19.18)	(4.69)	
West	1	−5.18***	0.20	sp	−56.88***	0.25	−0.91	−49.36**	0.25	−0.76	−51.52	1.33	0.25
		(0.99)			(11.99)		(1.57)	(22.06)		(3.63)	(52.20)	(31.06)	
	2	−7.59***	0.17	mp	−13.61***	0.22	3.81	−19.14*	0.22	4.72	−23.24**	37.12	0.23
		(2.27)			(3.85)		(6.15)	(10.37)		(6.24)	(11.42)	(26.13)	
	3	−3.19	0.11	mp	−1.53	0.03	−4.91*	1.80	0.12	3.88**	−19.87***	18.38***	0.40
		(2.07)			(1.48)		(2.61)	(1.34)		(1.89)	(4.56)	(3.48)	
North Central	1	−7.37***	0.44	sp	−69.69***	0.54	−1.96	−55.74***	0.55	−0.34	−81.15***	14.93	0.55
		(1.10)			(7.96)		(1.20)	(10.13)		(1.87)	(22.84)	(13.57)	
	2	−3.74	0.02	mp	−10.38***	0.08	12.74*	−28.85**	0.14	10.66	−22.59*	−40.94	0.15
		(2.46)			(3.63)		(7.05)	(11.18)		(7.37)	(11.81)	(25.16)	
	3	−2.72	0.07	mb	−1.76*	0.03	−2.63	−1.62*	0.09	−15.96***	19.13***	17.38***	0.32
		(1.98)			(0.96)		(1.79)	(0.91)		(2.34)	(3.47)	(2.58)	
North East	1	−10.30***	0.34	sp	−70.71***	0.33	−6.74***	−44.74**	0.43	−11.54***	0.01	−47.33***	0.51
		(1.90)			(14.37)		(1.86)	(17.25)		(2.65)	(26.30)	(14.89)	
	2	−5.74*	0.06	mp	−17.09**	0.10	−0.81	−15.86	0.10	0.45	−18.49	5.00	0.10
		(3.46)			(7.94)		(3.91)	(9.72)		(6.26)	(16.13)	(21.27)	
	3	−3.05*	0.09	mb	−2.35	0.02	−2.93*	−1.96	0.10	−20.30***	25.16***	23.87***	0.36
		(1.82)			(1.60)		(1.64)	(1.35)		(2.63)	(4.04)	(3.09)	

This table shows the results of the best performing peak rules in regressions of $PAGO_t$ constructed based on respondents' regions (South, West, North Central and North East) on changes in the regional unemployment rate. See Table 2 for further explanations. The results for each rule are reported in Table B.11.

Table 8: Test of the Herding Effect

(a) Effect via PEXP

	(1)	(2)	(3)	(4)	(5)
intercept	-2.40	-8.51	-2.73	-6.18	-10.76
	(7.61)	(6.96)	(7.78)	(7.54)	(6.97)
$PAGO^{\text{prelim}}$	0.82^{***}	0.87^{***}	0.80^{***}	0.82^{***}	0.85^{***}
	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)
$PEXP^{\text{prelim}}$	0.20^{**}	0.19^{**}	0.23^{***}	0.23^{***}	0.23^{***}
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Dif. Age		-0.69^{***}			-0.61^{***}
		(0.22)			(0.22)
Dif. End Grade			4.89^{**}		3.54
			(2.19)		(2.20)
Dif. Income				0.25^{***}	0.18^{**}
				(0.09)	(0.08)
Wald1	8.96	2.06	10.93	7.50	3.02
p-value	< 0.001	0.107	< 0.001	< 0.001	0.030
R^2	0.78	0.78	0.78	0.79	0.79

(b) Effect via BUS1Y

	(1)	(2)	(3)	(4)	(5)
intercept	14.79^{***}	8.26^{*}	16.65^{***}	13.07^{***}	9.09^{**}
	(4.69)	(4.77)	(4.32)	(4.19)	(4.26)
$PAGO^{\text{prelim}}$	0.78^{***}	0.84^{***}	0.77^{***}	0.79^{***}	0.83^{***}
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
$BUS1Y^{\text{prelim}}$	0.12^{**}	0.10^{**}	0.13^{***}	0.12^{**}	0.11^{**}
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Dif. Age		-0.62^{***}			-0.55^{***}
		(0.22)			(0.21)
Dif. End Grade			4.48^{**}		3.19
			(2.15)		(2.19)
Dif. Income				0.23^{***}	0.16^{**}
				(0.08)	(0.08)
Wald1	11.00	2.25	13.00	7.90	2.57
p-value	< 0.001	0.083	< 0.001	< 0.001	0.055
R^2	0.78	0.79	0.78	0.79	0.79

This table shows the results of regressions of $PAGO_t^{\text{pa}}$ on a constant, $PAGO_t^{\text{prelim}}$, the preliminary values of the forward-looking variables and control variables. The preliminary forward-looking variables *PEXP*, *BUS1Y* and *BUS5Y* are considered separately in panels (a-c) and jointly in panel (d). The preliminary variables are published during month t. $PAGO_t^{\text{pa}}$ is based on the interviews taken after the announcement of the preliminary values, and is available from January 2000 onwards. As control variables, we include the differences between the weighted averages of age, end grade and income between the post-announcement and preliminary sub samples. We report parameter estimates with standard errors in parentheses based on Newey and West (1987) with the Bartlett kernel and a bandwidth value of 12. The row "Wald1" gives the result of the Wald-test of the hypothesis that the intercept and the coefficients on $PAGO_t^{\text{prelim}}$ and the forward-looking variables are equal to zero, one and zero, respectively, with the p-value based on the F-distribution given below. The row "Wald2" in panel (d) gives the result of the Wald-tests of the hypothesis that the coefficients on the forward-looking variables are equal to zero, with the p-value based on the F-distribution given below. The row "R^2" gives the adjusted R^2. Superscripts ***,**,* indicate significance at the 1, 5 and 10% level. The results are based on 261 observations.

Table 8: Test of the Herding Effect – *continued*

(c) Effect via BUS5Y

	(1)	(2)	(3)	(4)	(5)
intercept	10.51**	4.01	11.84***	8.44**	4.22
	(4.58)	(4.56)	(4.32)	(4.12)	(4.03)
$PAGO^{\text{prelim}}$	0.86***	0.91***	0.84***	0.86***	0.89***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$BUS5Y^{\text{prelim}}$	0.08*	0.07	0.10**	0.09*	0.09*
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Dif. Age		−0.69***			−0.61***
		(0.21)			(0.20)
Dif. End Grade			4.61**		3.27
			(2.19)		(2.22)
Dif. Income				0.24***	0.17**
				(0.08)	(0.08)
Wald1	9.40	1.17	11.05	7.60	1.95
p-value	< 0.001	0.320	< 0.001	< 0.001	0.121
R^2	0.78	0.78	0.78	0.78	0.79

(d) Effect via PEXP, BUS1Y and BUS5Y

	(1)	(2)	(3)	(4)	(5)
intercept	4.69	−2.18	4.55	0.71	−4.39
	(8.53)	(7.93)	(8.57)	(8.62)	(8.06)
$PAGO^{\text{prelim}}$	0.75***	0.80***	0.72***	0.75***	0.78***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$PEXP^{\text{prelim}}$	0.20*	0.20*	0.22**	0.22**	0.23**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
$BUS1Y^{\text{prelim}}$	0.16**	0.14**	0.15**	0.15**	0.13*
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$BUS5Y^{\text{prelim}}$	−0.15	−0.15	−0.13	−0.13	−0.12
	(0.09)	(0.09)	(0.08)	(0.09)	(0.08)
Dif. Age		−0.62***			−0.55**
		(0.23)			(0.22)
Dif. End Grade			4.61**		3.35
			(2.08)		(2.10)
Dif. Income				0.23***	0.17*
				(0.09)	(0.09)
Wald1	6.90	2.01	8.28	5.03	2.28
p-value	< 0.001	0.077	< 0.001	< 0.001	0.047
Wald2	3.70	2.97	4.00	3.80	3.27
p-value	0.012	0.033	0.008	0.011	0.022
R^2	0.78	0.79	0.79	0.79	0.80

See table note on previous page.

Table 9: Test of the Herding Effect on Changes

(a) Effect via changes in PEXP

	$\Delta PAGO^{\text{pa}}$	$\Delta PAGO^{\text{pa}}$	$\Delta PAGO^{\text{pa}}$	$\Delta PAGO^{\text{pa}}$	$\Delta PAGO^{\text{pa}}$
intercept	3.19***	0.15	3.52***	2.56***	0.21
	(0.61)	(0.89)	(0.74)	(0.52)	(0.95)
$\Delta PAGO^{\text{prelim}}$	0.55***	0.57***	0.55***	0.56***	0.57***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.10)
$\Delta PEXP^{\text{prelim}}$	0.26**	0.30***	0.25**	0.27**	0.29***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.10)
Dif. Age		−0.84***			−0.78***
		(0.20)			(0.20)
Dif. End Grade			2.93		2.28
			(1.98)		(2.02)
Dif. Income				0.00***	0.00**
				(0.00)	(0.00)
Wald1	14.22	6.39	13.35	13.30	6.56
p-value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
R^2	0.17	0.22	0.17	0.20	0.24

(b) Effect via changes in BUS1Y

	$\Delta PAGO^{\text{pa}}$	$\Delta PAGO^{\text{pa}}$	$\Delta PAGO^{\text{pa}}$	$\Delta PAGO^{\text{pa}}$	$\Delta PAGO^{\text{pa}}$
intercept	2.87***	0.00	3.23***	2.24***	0.08
	(0.60)	(0.90)	(0.74)	(0.49)	(0.96)
$\Delta PAGO^{\text{prelim}}$	0.56***	0.60***	0.56***	0.57***	0.60***
	(0.12)	(0.11)	(0.12)	(0.12)	(0.11)
$\Delta BUS1Y^{\text{prelim}}$	0.09	0.07	0.09	0.09	0.07
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Dif. Age		−0.78***			−0.72***
		(0.21)			(0.20)
Dif. End Grade			3.08		2.49
			(1.99)		(2.07)
Dif. Income				0.00***	0.00**
				(0.00)	(0.00)
Wald1	17.37	4.39	17.65	14.41	4.42
p-value	< 0.001	0.005	< 0.001	< 0.001	0.005
R^2	0.16	0.20	0.16	0.19	0.22

This table shows the results of regressions of changes in $PAGO_t^{\text{pa}}$ on a constant, changes in $PAGO_t^{\text{prelim}}$, and changes in the preliminary values of the forward-looking variables and control variables. The Δ-operator gives the difference of a variable with respect to the final value of that variable in the previous period. The forward-looking variables *PEXP*, *BUS1Y* and *BUS5Y* are considered separately in panels (a-c) and jointly in panel (d). We report parameter estimates with standard errors in parentheses based on Newey and West (1987) with the Bartlett kernel and a bandwidth value of 12. The results are based on 261 observations. See Table 8 for further explanation.

Table 9: Test of the Herding Effect on Changes – ***continued***

(c) Effect via changes in BUS5Y

	$\Delta PAGO^{\mathrm{pa}}$	$\Delta PAGO^{\mathrm{pa}}$	$\Delta PAGO^{\mathrm{pa}}$	$\Delta PAGO^{\mathrm{pa}}$	$\Delta PAGO^{\mathrm{pa}}$
intercept	2.84^{***}	-0.09	3.23^{***}	2.21^{***}	0.01
	(0.61)	(0.90)	(0.75)	(0.51)	(0.96)
$\Delta PAGO^{\mathrm{prelim}}$	0.62^{***}	0.64^{***}	0.61^{***}	0.62^{***}	0.64^{***}
	(0.12)	(0.11)	(0.11)	(0.11)	(0.11)
$\Delta BUS5Y^{\mathrm{prelim}}$	0.02	0.01	0.03	0.03	0.02
	(0.09)	(0.09)	(0.08)	(0.09)	(0.08)
Dif. Age		-0.80^{***}			-0.74^{***}
		(0.20)			(0.20)
Dif. End Grade			3.26^{*}		2.65
			(1.96)		(2.01)
Dif. Income				0.00^{***}	0.00^{**}
				(0.00)	(0.00)
Wald1	10.79	3.83	10.56	10.17	3.97
p-value	< 0.001	0.010	< 0.001	< 0.001	0.009
R^2	0.15	0.20	0.16	0.18	0.22

(d) Effect via changes in PEXP, BUS1Y and BUS5Y

	$\Delta PAGO^{\mathrm{pa}}$	$\Delta PAGO^{\mathrm{pa}}$	$\Delta PAGO^{\mathrm{pa}}$	$\Delta PAGO^{\mathrm{pa}}$	$\Delta PAGO^{\mathrm{pa}}$
intercept	3.20^{***}	0.22	3.50^{***}	2.58^{***}	0.25
	(0.62)	(0.92)	(0.75)	(0.52)	(0.97)
$\Delta PAGO^{\mathrm{prelim}}$	0.53^{***}	0.55^{***}	0.52^{***}	0.53^{***}	0.56^{***}
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
$\Delta PEXP^{\mathrm{prelim}}$	0.24^{**}	0.29^{***}	0.23^{**}	0.25^{**}	0.29^{***}
	(0.11)	(0.10)	(0.10)	(0.11)	(0.10)
$\Delta BUS1Y^{\mathrm{prelim}}$	0.10	0.07	0.09	0.09	0.06
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
$\Delta BUS5Y^{\mathrm{prelim}}$	-0.11	-0.10	-0.09	-0.09	-0.08
	(0.12)	(0.12)	(0.11)	(0.11)	(0.12)
Dif. Age		-0.83^{***}			-0.76^{***}
		(0.21)			(0.20)
Dif. End Grade			2.68		2.08
			(1.90)		(1.95)
Dif. Income				0.00^{***}	0.00^{**}
				(0.00)	(0.00)
Wald1	11.09	3.98	10.82	9.49	4.02
p-value	< 0.001	0.002	< 0.001	< 0.001	0.002
Wald2	1.95	2.93	1.82	2.08	2.94
p-value	0.123	0.034	0.144	0.103	0.034
R^2	0.17	0.22	0.17	0.20	0.24

See table note on previous page.

Table 10: Test of the Herding Effect with Inclusion of Financial and Macro Variables

(a) Effect via *PEXP*

Rule	ra	peak	ra	peak
intercept	6.02	−2.95	−1.27	−12.61
	(11.51)	(10.39)	(12.36)	(11.02)
$PAGO^{\text{prelim}}$	0.57^{***}	0.53^{***}	0.63^{***}	0.59^{***}
	(0.08)	(0.08)	(0.10)	(0.09)
$PEXP^{\text{prelim}}$	0.34^{***}	0.45^{***}	0.34^{**}	0.47^{***}
	(0.13)	(0.12)	(0.14)	(0.12)
Dif. Age			-0.48^{**}	-0.52^{**}
			(0.24)	(0.24)
Dif. End Grade			3.04	2.43
			(2.12)	(2.18)
Dif. Income			0.18^{**}	0.15^{*}
			(0.08)	(0.08)
SP500 (peak: mb)	0.10	0.18^{*}	0.08	0.12
	(0.06)	(0.10)	(0.06)	(0.10)
BAMLCC (peak: sb)	0.03	0.78^{*}	−0.01	0.58
	(0.12)	(0.44)	(0.10)	(0.44)
UST3M (peak: mb)	1.10^{*}	0.52	1.07^{*}	0.60
	(0.63)	(0.59)	(0.64)	(0.56)
UST10Y (peak: sb)	−0.60	−6.74	−0.55	−4.19
	(1.11)	(4.57)	(1.10)	(4.45)
HPIQ (peak: sp)	0.73^{***}	1.25^{***}	0.60^{**}	0.95^{**}
	(0.25)	(0.37)	(0.26)	(0.40)
CPI (peak: sp)	0.47	5.93^{**}	0.10	4.85
	(0.61)	(3.00)	(0.56)	(3.06)
GNP (peak: mp)	−0.41	0.14	-0.54^{*}	0.05
	(0.30)	(0.40)	(0.28)	(0.41)
NFP (peak: mp)	2.44^{**}	2.01^{**}	2.38^{**}	2.54^{***}
	(0.95)	(0.82)	(1.02)	(0.87)
UNEMP (peak: mp)	2.25	0.10	2.16	0.07
	(1.50)	(0.65)	(1.60)	(0.64)
PCE (peak: mp)	−0.50	-0.78^{**}	−0.44	-0.95^{**}
	(0.41)	(0.37)	(0.37)	(0.38)
R^2	0.79	0.80	0.80	0.81

This table shows the results of regressions of $PAGO_t^{\text{pa}}$ on a constant, $PAGO_t^{\text{prelim}}$, the preliminary values of the forward-looking variables, control and predictive variables. The preliminary forward-looking variables *PEXP*, *BUS1Y* and *BUS5Y* are considered separately in panels (a-c) and jointly in panel (d). The preliminary variables are published during month t. $PAGO_t^{\text{pa}}$ is based on the interviews taken after the announcement of the preliminary values. As control variables, we include the differences between the weighted averages of age, end grade and income between the post-announcement and preliminary sub samples. We use the past yearly changes in financial and macro variables as predictors. The entry in the row "Rule" indicates whether we use the yearly change (rational rule) or the best performing peak rule, which we define as the peak rule that has the highest R^2 in a single regression of $PAGO_t$ on it. We indicate this selection in parentheses after the variable name. We report parameter estimates with standard errors in parentheses based on Newey and West (1987) with the Bartlett kernel and a bandwidth value of 12. The row "R^2" gives the adjusted R^2. The row "Wald2" in panel (d) gives the result of the Wald-tests of the hypothesis that the coefficients on the forward-looking variables are equal to zero, with the p-value based on the F-distribution given below. Superscripts ***,**,* indicate significance at the 1, 5 and 10% level. The sample period is from Jan-2000 to Sept-2021 ($T = 261$)

Table 10: Test of the Herding Effect with Inclusion of Financial and Macro Variables – *continued*

(b) Effect via $BUS1Y$

Rule	ra	peak	ra	peak
intercept	29.73***	29.51***	23.43***	22.19***
	(5.52)	(5.99)	(6.81)	(6.79)
$PAGO^{\text{prelim}}$	0.59***	0.62***	0.67***	0.68***
	(0.07)	(0.07)	(0.09)	(0.08)
$BUS1Y^{\text{prelim}}$	0.15**	0.13***	0.14**	0.13***
	(0.06)	(0.05)	(0.06)	(0.05)
Dif. Age			−0.43*	−0.45*
			(0.24)	(0.24)
Dif. End Grade			2.77	2.34
			(2.06)	(2.15)
Dif. Income			0.16**	0.13
			(0.08)	(0.09)
SP500 (peak: mb)	0.02	0.09	0.00	0.03
	(0.05)	(0.09)	(0.05)	(0.09)
BAMLCC (peak: sb)	0.07	0.78*	0.05	0.60
	(0.12)	(0.41)	(0.10)	(0.40)
UST3M (peak: mb)	0.76	−0.28	0.76	−0.15
	(0.67)	(0.64)	(0.68)	(0.63)
UST10Y (peak: sb)	−0.64	−6.76	−0.51	−4.41
	(1.15)	(4.28)	(1.12)	(4.21)
HPIQ (peak: sp)	0.82***	1.67***	0.70***	1.42***
	(0.23)	(0.34)	(0.24)	(0.37)
CPI (peak: sp)	1.11*	6.21**	0.68	5.20
	(0.65)	(3.11)	(0.60)	(3.16)
GNP (peak: mp)	−0.51*	−0.16	−0.62**	−0.25
	(0.27)	(0.40)	(0.24)	(0.41)
NFP (peak: mp)	2.33***	1.00	2.27**	1.35*
	(0.83)	(0.71)	(0.89)	(0.77)
UNEMP (peak: mp)	2.33*	0.28	2.28	0.25
	(1.40)	(0.54)	(1.51)	(0.53)
PCE (peak: mp)	−0.71	−0.51	−0.61	−0.63
	(0.45)	(0.38)	(0.41)	(0.40)
R^2	0.79	0.80	0.80	0.80

See note below panel a

Table 10: Test of the Herding Effect with Inclusion of Financial and Macro Variables – *continued*

(c) Effect via *BUS5Y*

Rule	ra	peak	ra	peak
intercept	26.28***	26.16***	19.61**	18.38***
	(6.47)	(6.34)	(7.82)	(7.07)
$PAGO^{\text{prelim}}$	0.66***	0.66***	0.73***	0.73***
	(0.07)	(0.07)	(0.08)	(0.07)
$BUS5Y^{\text{prelim}}$	0.12*	0.13**	0.11*	0.13**
	(0.06)	(0.05)	(0.06)	(0.05)
Dif. Age			−0.48**	−0.48**
			(0.24)	(0.23)
Dif. End Grade			3.12	2.64
			(2.15)	(2.24)
Dif. Income			0.16**	0.13
			(0.08)	(0.08)
SP500 (peak: mb)	0.03	0.08	0.00	0.02
	(0.05)	(0.10)	(0.05)	(0.10)
BAMLCC (peak: sb)	0.12	0.78*	0.09	0.60
	(0.11)	(0.41)	(0.09)	(0.40)
UST3M (peak: mb)	1.15*	0.66	1.11*	0.74
	(0.64)	(0.67)	(0.65)	(0.64)
UST10Y (peak: sb)	0.04	−5.43	0.12	−3.01
	(1.07)	(4.00)	(1.05)	(3.91)
HPIQ (peak: sp)	0.80***	1.63***	0.67***	1.37***
	(0.25)	(0.37)	(0.26)	(0.40)
CPI (peak: sp)	0.60	6.09**	0.21	5.10*
	(0.65)	(3.03)	(0.57)	(3.06)
GNP (peak: mp)	−0.41	−0.09	−0.54**	−0.17
	(0.27)	(0.38)	(0.25)	(0.39)
NFP (peak: mp)	2.21**	0.86	2.14**	1.27
	(0.94)	(0.73)	(1.00)	(0.82)
UNEMP (peak: mp)	2.15	0.27	2.06	0.25
	(1.59)	(0.56)	(1.70)	(0.54)
PCE (peak: mp)	−0.55	−0.47	−0.48	−0.61
	(0.47)	(0.37)	(0.43)	(0.40)
R^2	0.79	0.79	0.80	0.80

See note below panel a

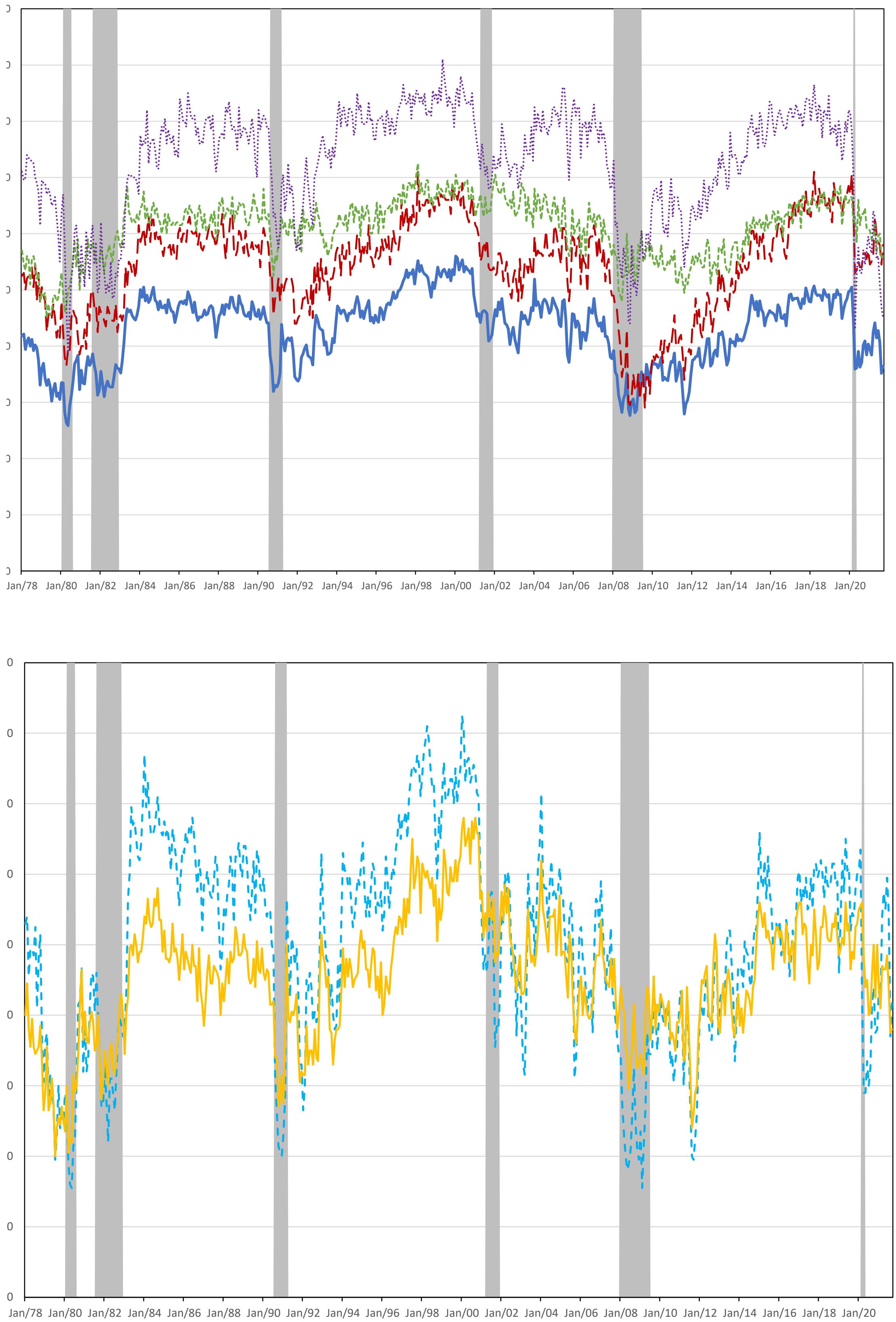
Table 10: Test of the Herding Effect with Inclusion of Financial and Macro Variables – *continued*

(d) Effect via $PEXP$, $BUS1Y$, and $BUS5Y$

Rule	ra	peak	ra	peak
intercept	17.44	6.02	8.24	−5.19
	(10.98)	(10.67)	(11.59)	(11.86)
$PAGO^{\text{prelim}}$	0.54***	0.52***	0.61***	0.58***
	(0.08)	(0.08)	(0.10)	(0.09)
$PEXP^{\text{prelim}}$	0.22	0.36***	0.25*	0.40***
	(0.14)	(0.13)	(0.14)	(0.13)
$BUS1Y^{\text{prelim}}$	0.16*	0.12	0.13	0.09
	(0.09)	(0.08)	(0.09)	(0.08)
$BUS5Y^{\text{prelim}}$	−0.11	−0.09	−0.08	−0.07
	(0.09)	(0.09)	(0.09)	(0.09)
Dif. Age			−0.44*	−0.49**
			(0.24)	(0.23)
Dif. End Grade			2.73	2.25
			(1.99)	(2.05)
Dif. Income			0.17**	0.14
			(0.08)	(0.09)
SP500 (peak: mb)	0.07	0.17*	0.05	0.11
	(0.06)	(0.09)	(0.06)	(0.09)
BAMLCC (peak: sb)	0.02	0.77*	−0.02	0.58
	(0.13)	(0.44)	(0.11)	(0.43)
UST3M (peak: mb)	0.68	−0.28	0.74	−0.02
	(0.70)	(0.76)	(0.70)	(0.75)
UST10Y (peak: sb)	−1.09	−7.66	−0.95	−5.01
	(1.21)	(4.69)	(1.17)	(4.56)
HPIQ (peak: sp)	0.78***	1.36***	0.64***	1.05***
	(0.23)	(0.34)	(0.24)	(0.38)
CPI (peak: sp)	0.99	6.02*	0.54	4.98
	(0.68)	(3.07)	(0.61)	(3.10)
GNP (peak: mp)	−0.50*	0.03	−0.61**	−0.03
	(0.29)	(0.43)	(0.27)	(0.43)
NFP (peak: mp)	2.51***	1.88**	2.45**	2.41***
	(0.86)	(0.76)	(0.95)	(0.83)
UNEMP (peak: mp)	2.49*	0.13	2.36	0.10
	(1.43)	(0.63)	(1.56)	(0.62)
PCE (peak: mp)	−0.64	−0.74**	−0.55	−0.91**
	(0.45)	(0.37)	(0.41)	(0.39)
Wald2	2.47	5.15	2.15	4.97
p-value	0.063	0.002	0.095	0.002
R^2	0.80	0.80	0.80	0.81

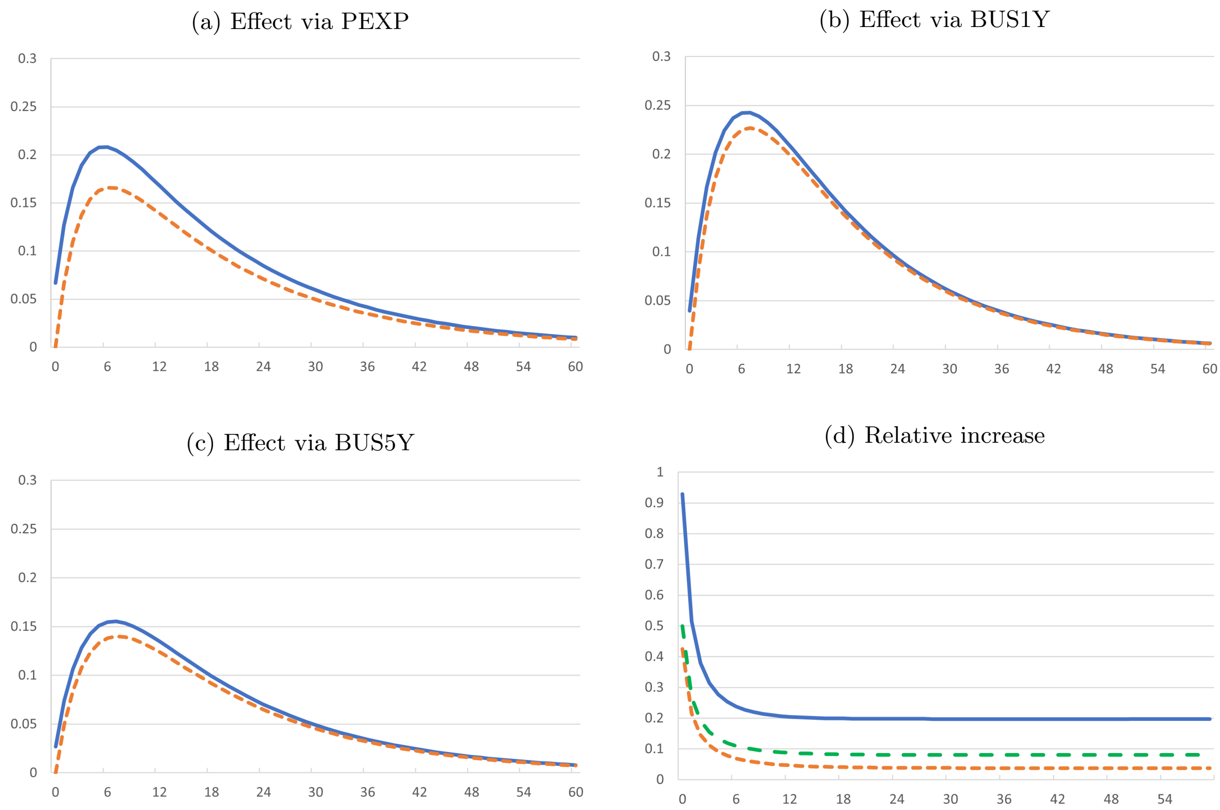
See note below panel a

Figure 1: Evolution of ICS variables



This figure shows the monthly values for ICS (blue, solid line), PAGO (red, long-dashed line), PEXP (green, short-dashed line) and DUR (purple, dotted line) in the top panel, and BUS1Y (light blue, short-dashed line), BUS5Y (orange, long-dashed line) in the bottom panel over the period January 1978 – September 2021. The grey areas indicate the NBER recession periods.

Figure 2: Impulse Response Analysis, bivariate models



(a) Effect via PEXP

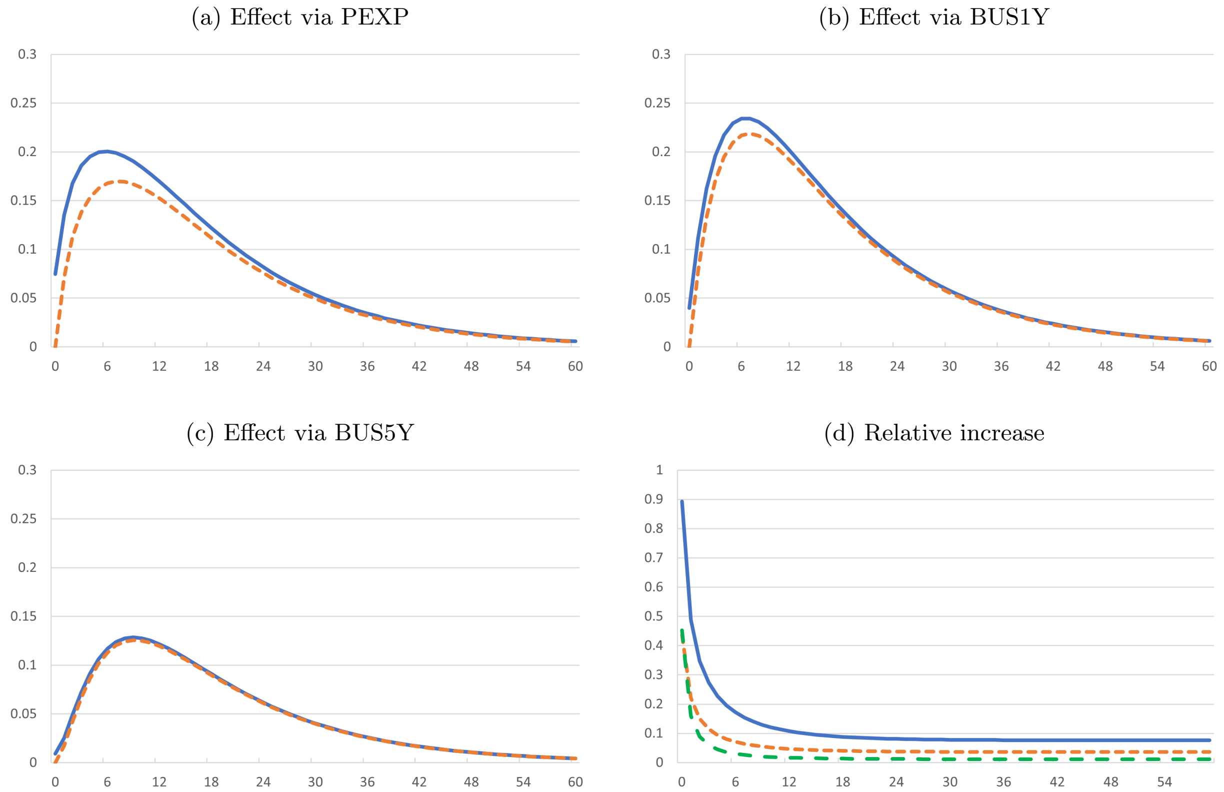
(b) Effect via BUS1Y

(c) Effect via BUS5Y

(d) Relative increase

This figure shows the impulse response functions of the final values of PAGO for different horizons based on a shock of 1 in one of the forward-looking variables (PEXP, BUS1Y and BUS5Y in panels a to c). The impulse response functions follow from Equations (10) and (15) combined with Equation (13) in system 1 (solid blue line) or with Equation (14) in system 2 (orange dotted line). The esimates for $\boldsymbol{\Phi}$ in Equation (10) are reported in Table C.3, the estimates for γ_1 in Table 8, and the estimates for γ_2 in Table C.4, all in the columns corresponding with the pa-series. Panel d gives the relative increase of the effect of the shock in system 1 compared to system 2 for each forward looking variable (PEXP: solid blue, BUS1Y: dotted orange and BUS5Y: dashed green).

Figure 3: Impulse Response Analysis, multivariate models



This figure shows tne impulse response functions of the final values of PAGO for different horizons based on a shock of 1 in one of the forward-looking variables (PEXP, BUS1Y and BUS5Y in panels a to c). We take the correlation between the shocks to the variables into account, and calculate the expected shocks in the other two variables as in Equation (16), assuming a linear model for the relation between $\boldsymbol{x}_t^{\text{prelim}}$ and $\boldsymbol{y}_{t-1}$ with normally distributed error terms. Estimation results for this model are in Table C.5. The (expected) shocks for the different panels are $(1, 0.576, 0.346)'$, $(0.136, 1, 0.513)'$ and $(0.132, 0.833, 1)'$. The impulse response functions follow from Equations (10) and (15) combined with Equation (13) in system 1 (solid blue line) or with Equation (14) in system 2 (orange dotted line). The esimates for $\boldsymbol{\Phi}$ in Equation (10) are reported in Table C.3, the estimates for γ_1 in Table 8, and the estimates for γ_2 in Table C.4(d), all in the columns corresponding with the pa-series. Panel d gives the relative increase of the effect of the shock in system 1 compared to system 2 for each forward looking variable (PEXP: solid blue, BUS1Y: dotted orange and BUS5Y: dashed green).

Appendices — For online publication

A Additional Data Analysis

A.1 Index of Consumer Sentiment Data

We investigate the time-series properties of the different ICS variables in Table A.1. The unit root tests all indicate that the ICS series is stationary. The (adjusted) Dickey-Fuller and Phillips-Perron tests reject the null-hypothesis of a unit root with p-values below 5%, and the KPSS-statistic is close to the 10% critical value. The results in panel (b) show that an AR(1)-model fits the data accurately. Higher order AR-terms and MA-terms do not improve the model.

[Table A.1 about here.]

[Table A.1 (continued)about here.]

For the PAGO series, the evidence is less clear cut. The Dickey-Fuller and Phillips-Perron tests reject the hypothesis of a unit root, but the Adjusted Dickey-Fuller test does not reject. The KPSS-test does not reject stationarity at the 5% level. Apparently, the lag structure is more intricate. Our results in panels (c) indicate a strong MA(1)-term next to an AR(1) term close the one. Since the MA(1)-term is negative, the effect of shocks is reduced. We do not find evidence in favour of higher order ARMA-models.

Our analysis of the PEXP and DUR series shows results that are comparable to the PAGO findings. We find rejection of a unit root by the DF- and PP-tests, but not by the ADF test. The KPSS-statistics are higher but below the 5% critical value. Also for PEXP, an ARMA(1,1) model seems most suitable. For DUR an ARMA(2,1) seems better. For both the PAGO and PEXP series we maintain the hypothesis of stationarity.

For BUS1Y and BUS5Y, the hypothesis of a unit root is clearly rejected by the three tests. The KPSS statistics do not reject the hypothesis of stationarity for BUS1Y, but do so for BUS5Y at the 5% level, though not at 1%. Both series show evidence of ARMA effects with the ARMA(2,1)-specification performing best. We take these ARMA effects into account in our main analyses.

A.2 Demographic variables in the CAB survey

Table A.2 gives an overview of the demographic variables that we evaluate as control variables for the herding analysis in Section 5. We transform the binary variables such that their average value gives the percentage of respondents that own a home (HOMEOWN), have stock market investments (INVEST), or are female (SEX). Marital status 2 (separated) does never occur in our sample period.

[Table A.2 about here.]

In each month, we calculate the weighted average of each non-categorical demographic variable, and the weighted frequency of each category of the categorical variables. We create subsamples for the respondents whose responses are included in the preliminary annoucements (prelim) and those whose interviews take place after the preliminary announcement (pa). The differences between the prelim- and pa-values are used as regressors in Section 5.

We test for the presence of a structural difference between the premlim- and pa-values. For the discrete and continuous variables, we use a linear panel model with time-fixed effects,

$$y_{it} = \mu_t + \delta d_{it} + \varepsilon_{it}, \quad \varepsilon_{it} \sim \text{NID}(0, \sigma^2), \tag{A.1}$$

where y_{it} gives the value for respondent i in month t, $d_{it} = 1$ if the respondent is interviewed after the preliminary announcement and zero otherwise, and μ_t and δ are parameters. Our test for a structural difference between the prelim- and pa-values takes the form of a t-test of $\delta = 0$ versus $\delta \neq 0$. We estimate the parameters and conduct the test using weighted linear regression, with the weights as present in the CAB.

For the binary and categorical variables, we model the probability of the respondent belonging to category c out of C categories as

$$\Pr[y_{ict} = 1] = p_{ct} + \delta_c d_{it}, \tag{A.2}$$

where $y_{ict} = 1$ if respondent i in month t belongs to category c, and zero otherwise. The parameters are restricted by $\sum_{c=1}^{C} p_{ct} = 1$ for each t and $\sum_{c=1}^{C} \delta_c = 0$. We estimated the parameters by weighted maximum likelihood, and test again $\delta = 0$ by a t-test.

Table A.3 presents summary statistics of the different demographic variables. We present the time-series averages and standard deviations of the prelim- and pa-values, and our test for structural differences. Pa-respondents are on average 5 years younger, and have received slightly less schooling. They are less likely to own a house (by 5.6%), though if they do the house is worth \$ 17,000 more. Their income is on average \$ 3,800 higher. They are less likely to invest (by 2.3%), and their portfolio is also worth less (by \$ 35,000). The average number of adults and children are higher, and they are more likely to be female. They are more likely to be married or partnered, or to have never married, but less likely to be widowed. Finally, pa-respondents are more likely to live in the West and less in North-Central. Most differences are significant, but this result is largely due to the size of the panel (mostly 180 months with around 500 respondents per month).

[Table A.3 about here.]

Table A.1: Time Series Properties of CAB series

(a) Unit Root Tests

	ICS	PAGO	PEXP	BUS	BUS5Y	DUR
DF, p-value	0.006	0.001	<0.0001	0.0003	<0.0001	0.001
ADF, lags	0	2	5	0	1	2
ADF, p-value	0.006	0.088	0.149	0.0003	0.001	0.066
PP, p-value	0.011	0.008	0.000	0.001	0.000	0.012
KPSS, statistic	0.225	0.186	0.323	0.205	0.408	0.231

(b) ARMA models for ICS

C	AR(1)	AR(2)	MA(1)	MA(2)	BIC
85.6	0.95	−0.002			5.6401
(3.47)	(0.04)	(0.04)			
85.6	0.95		0.003		5.6401
(3.47)	(0.01)		(0.04)		
85.6	0.95				5.6281
(3.48)	(0.01)				

(c) ARMA models for PAGO

C	AR(1)	AR(2)	MA(1)	MA(2)	BIC
108.7	1.33	−0.34	−0.75	0.10	6.3833
(7.23)	(0.80)	(0.78)	(0.80)	(0.35)	
108.6	1.11	−0.12	−0.53		6.3726
(7.17)	(0.09)	(0.09)	(0.09)		
108.6	0.98		−0.41	−0.04	6.3726
(7.07)	(0.01)		(0.04)	(0.04)	
108.6	0.63	0.32			6.3860
(5.38)	(0.04)	(0.04)			
108.6	0.98		−0.42		6.3626
(6.77)	(0.01)		(0.04)		
108.5	0.93				6.4814
(3.96)	(0.02)				

(d) ARMA models for PEXP

C	AR(1)	AR(2)	MA(1)	MA(2)	BIC
120.5	1.39	−0.40	−0.90	0.13	5.9320
(4.42)	(0.40)	(0.39)	(0.40)	(0.23)	
120.5	1.16	−0.17	−0.66		5.9238
(4.30)	(0.08)	(0.08)	(0.06)		
120.6	0.98		−0.50	−0.07	5.9238
(4.14)	(0.01)		(0.04)	(0.05)	
121.5	0.58	0.34			5.9592
(2.57)	(0.04)	(0.04)			
120.9	0.98		−0.52		5.9177
(3.76)	(0.01)		(0.03)		
121.8	0.88				6.0725
(1.81)	(0.02)				

This table shows the resuls of a time-series analysis for the CAB series. Panel (a) gives the results of the following unit root tests: Dickey-Fuller (DF), Adjusted Dickey Fuller (ADF) with automatic lag selection based on BIC, Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS). The last two use the Bartlett kernel and Newey-West bandwidth. The p-values of the first three tests are reported, and the statistic of the KPSS test. Critical values for the KPSS test are 0.347, 0.463 and 0.739 at the 10, 5 and 1% confidence level. Panels (b-g) show the estimation results for various ARMA-models. Standard errors are reported in parenthesis. The column labeled "C" gives the unconditional average. The column labeled "BIC" gives the Bayesian Information Criterion.

Table A.1: Time Series Properties of CAB series – *continued*

(e) ARMA models for BUS

C	AR(1)	AR(2)	MA(1)	MA(2)	BIC
100.8	0.95	−0.03			7.6228
(6.33)	(0.04)	(0.04)			
100.8	0.92		0.04		7.6227
(6.29)	(0.02)		(0.04)		
100.8	0.93				7.6116
(6.48)	(0.02)				

(f) ARMA models for BUS5Y

C	AR(1)	AR(2)	MA(1)	MA(2)	BIC
90.0	1.39	−0.41	−0.66	−0.02	6.9124
(5.63)	(0.26)	(0.25)	(0.26)	(0.10)	
89.9	1.44	−0.46	−0.71		6.9036
(5.68)	(0.11)	(0.11)	(0.10)		
90.2	0.96		−0.23	−0.13	6.9036
(5.10)	(0.01)		(0.04)	(0.05)	
90.5	0.76	0.15			6.9138
(3.98)	(0.04)	(0.04)			
90.4	0.94		−0.23		6.9056
(4.38)	(0.01)		(0.04)		
90.6	0.90				6.9256
(3.39)	(0.02)				

(g) ARMA models for DUR

C	AR(1)	AR(2)	MA(1)	MA(2)	BIC
141.7	1.31	−0.32	−0.54	−0.05	6.9199
(9.02)	(0.31)	(0.30)	(0.32)	(0.10)	
141.7	1.42	−0.43	−0.66		6.9094
(9.10)	(0.14)	(0.13)	(0.12)		
142.0	0.97		−0.20	−0.12	6.9094
(8.44)	(0.01)		(0.04)	(0.05)	
143.1	0.80	0.15			6.9168
(6.35)	(0.04)	(0.04)			
142.7	0.96		−0.21		6.9100
(7.07)	(0.01)		(0.04)		
143.6	0.93				6.9261
(5.26)	(0.02)				

See table note on previous page.

Table A.2: Demographics Codebook

Variable	Content	Type	Labels
AGE	Age of Respondent	Discrete	97: 97 or older
EGRADE	Highest Grade Completed	Discrete	
HOMEAMT	Market Value of Home	Continuous	$\times$ 1000
HOMEOWN	Own or Rent Home	Binary	1: Owns or is buying 2: Rent
INCOME	Total Income Previous Year	Continuous	x 1000
INVAMT	Current Investment Value Stock Market	Continuous	x 1000
INVEST	Have Stock Market Investments	Binary	1: Yes 5: No
MARRY	Marital Status	Categorical	1: Married/Partner 2: Seperated 3: Divorced 4: Widowed 5: Never married
NUMADT	Number of Adults (18+)	Discrete	
NUMKID	Number of Kids (<18)	Discrete	
REGION	Region of Residence	Categorical	1: West 2: North Central 3: Northeast 4: South
SEX	Sex of Respondent	Binary	1: Male 2: Female

This table gives an overview of the demographic variables that are collected in the CAB and we consider as control variables in Section 5. The columns "Variable" and "Content" give the abbreviation and definition that the CAB uses. In the column "Type" gives the type of the variables. The column label gives the coding for binary and categorical variables, and the transformation for the case of continuous variables. The information is taken from `https://data.sca.isr.umich.edu/sda-public/sca/Doc/sca.htm`.

Table A.3: Summary statistics of the demographic variables

(a) Non-categorical variables

		prelim		pa			
	obs.	average	std. dev.	average	std. dev.	δ	std. error
Age	261	52.12	2.83	48.43	2.82	-3.84^{***}	(0.11)
End Grade	261	14.25	0.35	14.13	0.46	-0.12^{***}	(0.02)
Homeamt (×1000)	192	293.24	60.07	305.96	64.15	13.01^{***}	(3.09)
Homeown (% owning)	261	74.73	5.82	71.56	5.48	-3.34^{***}	(0.28)
Income (×1000)	261	75.39	15.93	77.96	15.60	2.65^{***}	(0.50)
Invamt (×1000)	260	275.95	109.23	239.87	112.53	-36.39^{***}	(6.29)
Invest (% investing)	260	62.08	6.07	60.33	7.39	-1.78^{***}	(0.30)
Numadt	261	1.86	0.11	1.92	0.11	0.06^{***}	(0.01)
Numkid	261	0.58	0.08	0.72	0.15	0.15^{***}	(0.01)
Sex (% female)	261	51.25	5.05	52.32	5.74	1.07^{***}	(0.31)

(b) Marital status (% per category)

		prelim		pa			
	obs.	average	std. dev.	average	std. dev.	δ	std. error
Married/Partnered	261	58.80	3.12	60.36	5.06	1.65^{***}	(0.31)
Divorced	261	15.61	2.13	15.52	3.31	-0.11	(0.23)
Widowed	261	10.23	2.96	6.95	2.47	-3.42^{***}	(0.16)
Never Married	261	15.36	4.03	17.17	4.47	1.87^{***}	(0.23)

(c) Region (% per category)

		prelim		pa			
	obs.	average	std. dev.	average	std. dev.	δ	std. error
North Central	261	24.97	1.98	23.09	3.57	-1.98^{***}	(0.27)
North East	261	18.02	2.15	18.01	3.31	0.00	(0.24)
South	261	36.12	2.02	36.43	3.82	0.30	(0.30)
West	261	20.88	2.19	22.48	3.57	1.68^{***}	(0.26)

This table gives summary statistics of the monthly weighted averages of the non-categorical variables (panel a) and frequencies (panels b and c) of the categorical variables in the CAB. For each month, we calculate the weighted values using the weights that are assigned in the CAB. We split the sample according to those respondents whose responses are included in the preliminary announcement (prelim), and those respondents interviews after the preliminary announcement (pa). We report the time-series averages and standard deviations for both subsamples. We test whether for a structural differ between the prelim and pa groups and report the estimated difference in the column labeled "δ" with its standard error next to it. For the discrete and continuous variables, we estimate δ in the panel model of Equation (A.1) with weighted least squares. For the binary and categorical variables, we estimate δ in the panel model of Equation (A.2) with weighted maximum likelihood. We test $\delta = 0$ by a t-test and evaluate the test-statistic by a normal distribution. Superscripts ***,**,* indicate significance at the 1, 5 and 10% level.

B Supplement for the peak-end analysis

B.1 Data sources

We provide an overview of the data that we use for the explanatory variables in Section 4 in Table B.1. Some further remarks

- BAMLCC is based on a large set of corporate bonds.
- HPIM is based on purchases only. HPIQ also includes appraisal data.
- The CPI series is reset on January 1988. We have compiled a new series with a single base date based on the relative changes reported in ALFRED.

[Table B.1 about here.]

B.2 Full results of Section 4.3

[Table B.2 about here.]

[Table B.3 about here.]

[Table B.4 about here.]

[Table B.4 (continued)about here.]

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[Table B.6 about here.]

[Table B.7 about here.]

B.3 Additional results for specific groups of respondents

We use the following variables to group respondents.

- INVEST: Do you (or any member of your family living there) have any investments in the stock market, including any publicly traded stock that is directly owned, stocks in mutual funds, stocks in any of your retirement accounts, including 401(K)s, IRAs, or Keogh accounts?
  Category labels: 1, yes; 5 no; 99, NA.
- HOMEOWN: Do you (and your family living there) own your own home, pay rent, or what?
  Category labels: 1, owns or is buying; 2 pays rent; 99, NA.
- PJOB: During the next 5 years, what do you think the chances are that you (or your husband/wife) will lose a job you wanted to keep?
  Category labels: 0%, 1-24%, 25-49%, 50%, 51-74%, 75-99%, 100%, don't know, no answer, mean.

[Table B.8 about here.]

[Table B.9 about here.]

[Table B.10 about here.]

[Table B.11 about here.]

[Table B.11 (continued)about here.]

[Table B.11 (continued)about here.]

[Table B.11 (continued)about here.]

B.4 Test Results for different reference periods

[Table B.12 about here.]

[Table B.13 about here.]

[Table B.14 about here.]

[Table B.15 about here.]

[Table B.16 about here.]

Table B.1: Source and Description of Explanatory Variables in the Peak-End Analysis

(a) Financial Variables

Abbrev.	Source	ID	Freq.	Unit	First Obs.	Description
SP500	Bloomberg		M	Index	Jan-78	S&P500 index
BAMLCC	FRED	BAMLCC0A0CMTRIV	M	Index	Jan-78	ICE BofA Corporate Index Total Return Index Value
HPIQ	FRED	USSTHPI	Q	Index 1980:Q1=100	Jan-78	All-Transactions House Price Index for the US
UST3M	FRED	TB3MS	M	Percent	Jan-78	3-Month Treasury Bill: Secondary Market Rate
UST10Y	FRED	GS10	M	Percent	Jan-78	10-Year Treasury Constant Maturity Rate

(b) Macro Variables

Abbrev.	Source	ID	Freq.	Unit	First Obs. ALFRED	Description
CPI	ALFRED	CPIAUCSL	M	Index 1982-1984=100	Jan-78	Consumer Price Index for All Urban Consumers: All Items
GNP	ALFRED	GNP	Q	Billions of Dollars	Jan-78	Gross National Product
NFP	ALFRED	PAYEMS	M	Thousands of Persons	Jan-78	All Employees: Total Nonfarm Payrolls
UNEMP	ALFRED	UNRATE	M	Percent	Jan-78	Civilian Unemployment Rate
PCE	ALFRED	PCE	M	Billions of Dollars	Jan-81	Personal Consumption Expenditures
UNEMPNE	FRED	CNERURN	M	Percent	Jan-78	Unemployment Rate in Northeast Census Region
UNEMPNC	FRED	CMWRUR	M	Percent	Jan-78	Unemployment Rate in Midwest Census Region
UNEMPS	FRED	CSOUUR	M	Percent	Jan-78	Unemployment Rate in South Census Region
UNEMPW	FRED	CWSTUR	M	Percent	Jan-78	Unemployment Rate in West Census Region

This table gives for each variable used in the analyses of the peak and end rules in Section 4 the abbreviation that we use, the source, the ID in this source, the frequency (M for monthly, Q for Quarterly), the unit, the data of the first observation that we use in the analysis and a brief description. For the macro variables we use the vintage data from ALFRED. ALFRED is available from the Federal Reserve Bank of St. Louis.

Table B.2: Summary Statistics of Financial Variables and their Peak and End Rule Transformations

(a) Means and standard deviations

(sub)sample		SP500, change in log full	1st	2nd	3rd	BAMLCC, change in log full	1st	2nd	3rd	UST3M, change in level full	1st	2nd	3rd	UST10Y, change in level full	1st	2nd	3rd	HPIQ, change in log full	1st	2nd	3rd
ra	mean	8.41	9.64	8.18	7.44	7.43	9.67	7.14	5.49	−0.12	−0.06	0.02	−0.32	−0.14	0.00	−0.19	−0.24	4.39	5.86	5.38	1.99
	stdev	15.39	13.76	15.34	16.88	7.50	9.93	5.18	5.95	1.75	2.50	1.38	1.04	1.26	1.82	0.95	0.73	4.14	3.49	2.57	4.87
sp	mean	6.97	8.04	6.06	6.80	2.99	4.63	2.21	2.15	0.37	0.76	0.23	0.11	0.41	0.59	0.37	0.28	1.93	2.45	1.89	1.47
	stdev	2.47	2.33	2.18	2.48	2.11	2.91	0.61	0.81	0.54	0.79	0.13	0.11	0.27	0.37	0.13	0.12	1.07	1.11	0.84	1.02
mp	mean	17.79	18.87	16.47	18.02	9.95	13.51	8.55	7.83	0.99	1.98	0.72	0.27	0.93	1.40	0.81	0.59	5.01	6.07	5.38	3.60
	stdev	8.70	8.85	8.49	8.65	6.40	8.01	4.25	4.70	1.47	2.10	0.68	0.31	0.77	1.04	0.49	0.35	3.07	3.27	2.56	2.81
sb	mean	−6.81	−7.69	−5.77	−6.97	−2.07	−2.61	−1.41	−2.20	−0.51	−1.04	−0.26	−0.23	−0.47	−0.68	−0.33	−0.38	0.34	0.61	0.85	−0.43
	stdev	4.64	5.23	3.95	4.46	2.01	2.20	0.71	2.45	0.85	1.25	0.23	0.37	0.35	0.47	0.11	0.25	1.29	1.12	0.62	1.56
mb	mean	−11.06	−11.02	−9.51	−12.63	−3.16	−4.35	−2.16	−2.97	−1.13	−2.15	−0.67	−0.56	−1.07	−1.47	−0.93	−0.81	0.14	0.61	0.89	−1.08
	stdev	10.52	7.97	9.10	13.45	3.49	4.65	1.49	3.22	1.65	2.24	0.88	0.94	0.82	1.15	0.46	0.51	1.97	1.23	0.62	2.72
end	mean	0.74	0.85	0.70	0.66	0.62	0.83	0.59	0.44	−0.01	−0.01	0.01	−0.03	−0.01	0.00	−0.02	−0.02	1.11	1.39	1.36	0.60
	stdev	4.36	4.65	3.96	4.46	1.79	2.48	1.17	1.46	0.45	0.74	0.19	0.17	0.31	0.43	0.23	0.20	1.29	1.17	0.75	1.63

(b) Correlations of the Peak and End Rule Transformations with the Rational Rule

(sub)sample	SP500 full	1st	2nd	3rd	BAMLCC full	1st	2nd	3rd	UST3M full	1st	2nd	3rd	UST10Y full	1st	2nd	3rd	HPIQ full	1st	2nd	3rd
sp	0.13	0.42	−0.11	0.08	0.32	0.19	0.63	0.43	0.21	0.25	0.58	−0.39	0.43	0.43	0.53	0.53	0.83	0.75	0.93	0.87
mp	0.67	0.79	0.73	0.52	0.84	0.81	0.95	0.83	0.48	0.53	0.82	0.24	0.71	0.74	0.89	0.68	0.94	0.98	1.00	0.93
sb	0.50	0.47	0.38	0.69	0.34	0.37	0.56	0.45	0.30	0.26	0.84	0.85	0.31	0.32	0.65	0.61	0.90	0.76	0.92	0.95
mb	0.76	0.68	0.76	0.82	0.47	0.53	0.59	0.56	0.51	0.46	0.89	0.95	0.66	0.70	0.88	0.86	0.90	0.79	0.94	0.95
end	0.30	0.25	0.36	0.29	0.34	0.37	0.32	0.22	0.32	0.30	0.52	0.47	0.34	0.36	0.30	0.27	0.82	0.72	0.82	0.85

This table shows summary statistics of the series of the financial variables that have been transformed according to different rules, given in the rows, corresponding with the full and the three subperiods. The rational rule is given in Equation (3), the peak rules in Equation (4) and the end rule in Equation (5). All rules use the observations of the past year. In panel (a) we report the mean and standard deviation of each transformed series. In panel (b) we report for each variable the correlation of the series transformed by the peak and end rules with the series according to the rational rule. In the top op panel (a) we indicate whether the base series are differences in logs or in levels. The subsample period runs from January 1978 to June 1992 ($T = 174$), from July 1992 to December 2006 ($T = 174$), and from January 2007 to September 2021 ($T = 177$). See Table B.1 for more information on the source and nature of the explanatory variables.

Table B.3: Summary Statistics of Macroeconomic Variables and their Peak and End Rule Transformations

(a) Means and standard deviations

(sub)sample		CPI, change in log full	1st	2nd	3rd	GNP, change in log full	1st	2nd	3rd	NFP, change in log full	1st	2nd	3rd	UNEMP, change in level full	1st	2nd	3rd	PCE, change in log full	1st	2nd	3rd
ra	mean	3.39	5.73	2.61	1.86	5.66	7.97	5.70	3.36	1.29	2.00	1.49	0.41	−0.02	−0.02	−0.16	0.12	5.43	7.54	5.87	3.34
	stdev	2.61	3.14	0.71	1.30	3.12	2.80	1.93	2.64	2.37	2.08	1.30	3.08	1.46	1.16	0.59	2.16	3.07	2.03	1.41	3.58
sp	mean	0.66	0.84	0.57	0.58	2.48	3.12	2.27	2.07	0.51	0.56	0.40	0.55	0.50	0.36	0.24	0.90	1.76	2.00	1.59	1.73
	stdev	0.29	0.34	0.23	0.18	1.40	1.18	1.00	1.69	0.54	0.27	0.24	0.86	1.51	0.20	0.10	2.55	1.33	0.72	0.45	2.06
mp	mean	3.58	5.79	2.66	2.32	5.99	7.97	5.74	4.29	2.02	2.50	1.69	1.88	0.82	0.74	0.42	1.30	6.16	7.79	5.96	5.09
	stdev	2.46	3.08	0.69	0.99	2.72	2.80	1.86	2.00	1.51	1.41	1.01	1.87	1.73	0.71	0.38	2.81	3.06	1.98	1.33	4.24
sb	mean	−0.13	0.09	−0.09	−0.38	0.41	1.04	0.71	−0.52	−0.50	−0.23	−0.11	−1.15	−0.33	−0.31	−0.26	−0.41	−0.77	−0.69	−0.21	−1.38
	stdev	0.37	0.30	0.18	0.42	1.83	0.73	0.62	2.77	2.19	0.27	0.17	3.67	0.32	0.12	0.08	0.53	2.18	0.63	0.46	3.47
mb	mean	−0.23	0.04	−0.11	−0.63	0.43	1.12	0.77	−0.58	−0.76	−0.56	−0.21	−1.50	−0.80	−0.72	−0.53	−1.14	−1.02	−0.75	−0.21	−2.02
	stdev	0.63	0.40	0.21	0.85	1.98	0.75	0.62	3.02	2.35	0.78	0.34	3.85	1.13	0.58	0.24	1.80	3.28	0.65	0.46	5.25
end	mean	0.28	0.47	0.21	0.17	1.42	1.94	1.44	0.88	0.11	0.16	0.13	0.04	0.00	0.00	−0.02	0.01	0.45	0.62	0.48	0.30
	stdev	0.33	0.35	0.23	0.33	1.44	1.06	0.82	1.96	0.71	0.28	0.18	1.18	0.51	0.22	0.16	0.84	1.09	0.82	0.54	1.57

(b) Correlations of the Peak and End Rule Transformations with the Rational Rule

(sub)sample	CPI full	1st	2nd	3rd	GNP full	1st	2nd	3rd	NFP full	1st	2nd	3rd	UNEMP full	1st	2nd	3rd	PCE full	1st	2nd	3rd
sp	0.76	0.87	0.61	0.25	0.47	0.79	0.76	−0.08	−0.07	0.73	0.70	−0.33	0.58	0.58	0.68	0.64	0.05	0.63	0.28	−0.09
mp	0.98	1.00	0.97	0.79	0.84	1.00	1.00	0.29	0.36	0.97	0.99	−0.10	0.75	0.88	0.89	0.76	0.47	0.97	0.98	0.16
sb	0.65	0.71	0.06	0.64	0.66	0.65	0.66	0.74	0.66	0.67	0.80	0.78	−0.05	0.47	0.47	−0.12	0.47	0.28	0.39	0.52
mb	0.56	0.68	0.14	0.66	0.68	0.72	0.72	0.77	0.79	0.90	0.88	0.87	0.11	0.77	0.74	0.00	0.50	0.29	0.39	0.56
end	0.63	0.74	0.39	0.27	0.57	0.62	0.59	0.47	0.32	0.55	0.55	0.29	0.28	0.41	0.31	0.26	0.29	0.26	0.29	0.28

This table shows summary statistics of the series of the macro variables that have been transformed according to different rules, given in the rows, corresponding with the full and the three subperiods. The rational rule is given in Equation (3), the peak rules in Equation (4) and the end rule in Equation (5). All rules use the observations of the past year. In panel (a) we report the mean and standard deviation of each transformed series. In panel (b) we report for each variable the correlation of the series transformed by the peak and end rules with the series according to the rational rule. In the top op panel (a) we indicate whether the base series are differences in logs or in levels. The subsample period runs from January 1978 to June 1992 ($T = 174$), from July 1992 to December 2006 ($T = 174$), and from January 2007 to September 2021 ($T = 177$). For PCE, the first observation pertains to January 1981. See Table B.1 for more information on the source and nature of the explanatory variables.

Table B.4: Tests Results of the Peak Rules applied to financial variables: S&P500

(a) S&P500, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	0.35**	0.30**		0.37***	0.35**		0.58***	0.71***		0.32**	0.38**		0.07	−0.11
	(0.14)	(0.14)		(0.14)	(0.17)		(0.17)	(0.24)		(0.16)	(0.17)		(0.20)	(0.19)
g^r			−0.62	−0.91	−0.71	0.08	−0.60**	−0.82**	0.75	0.21	−1.21	0.62***	0.54*	1.12***
			(0.63)	(0.58)	(1.11)	(0.25)	(0.30)	(0.39)	(0.61)	(0.58)	(1.10)	(0.19)	(0.31)	(0.40)
vol.		−0.37			−0.12			0.38			−1.20			0.87
		(0.41)			(0.68)			(0.50)			(0.80)			(0.59)
R^2	0.10	0.11	0.01	0.12	0.12	0.00	0.15	0.16	0.04	0.10	0.13	0.15	0.15	0.17

(b) S&P500, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	0.11	0.13		0.08	0.12		0.06	0.17		0.18	0.24		0.19	0.15
	(0.17)	(0.17)		(0.20)	(0.23)		(0.32)	(0.32)		(0.20)	(0.26)		(0.24)	(0.25)
g^r			0.61	0.41	0.17	0.18	0.11	−0.07	−0.15	−0.37	−1.00	0.03	−0.19	−0.05
			(0.98)	(1.17)	(1.43)	(0.26)	(0.49)	(0.49)	(0.49)	(0.59)	(1.67)	(0.37)	(0.48)	(0.71)
vol.		0.25			0.21			0.30			−0.66			0.20
		(0.59)			(0.72)			(0.65)			(1.54)			(0.89)
R^2	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.02	−0.01	0.01	0.00

(c) S&P500, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	0.32***	0.43***		0.34***	0.48***		0.12	0.53***		0.43***	0.43***		0.57***	0.26
	(0.08)	(0.06)		(0.08)	(0.06)		(0.12)	(0.16)		(0.06)	(0.06)		(0.12)	(0.19)
g^r			0.86	1.13	−1.69	0.66***	0.50**	−0.20	−0.50	−1.14***	−0.03	0.18	−0.55**	0.53
			(0.96)	(0.89)	(1.28)	(0.15)	(0.22)	(0.30)	(0.55)	(0.23)	(0.88)	(0.19)	(0.24)	(0.57)
vol.		0.92***			1.50***			1.09***			0.90			1.45**
		(0.23)			(0.43)			(0.36)			(0.70)			(0.65)
R^2	0.21	0.39	0.03	0.25	0.43	0.27	0.27	0.39	0.03	0.35	0.38	0.02	0.29	0.41

(d) S&P500, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	0.55***	0.31		0.57***	0.07		0.88***	0.90**		0.19	0.48		−0.22	−0.30
	(0.17)	(0.24)		(0.17)	(0.32)		(0.11)	(0.35)		(0.32)	(0.36)		(0.38)	(0.37)
g^r			−1.54	−1.85	2.97	−0.37	−1.27***	−1.30**	2.44***	1.93	−2.03	0.94***	1.17***	1.40**
			(1.55)	(1.25)	(2.55)	(0.54)	(0.38)	(0.61)	(0.70)	(1.23)	(2.74)	(0.11)	(0.39)	(0.62)
vol.		−1.33*			−2.50**			0.05			−2.47			0.37
		(0.69)			(1.24)			(1.06)			(1.52)			(1.14)
R^2	0.17	0.28	0.03	0.21	0.30	0.02	0.35	0.35	0.24	0.25	0.29	0.33	0.34	0.34

This table shows the results of regressions of $PAGO_t$ on changes in the log of the S&P500 Index over the past year that have been transformed based on different rules. The panels correspond with different period periods, and the blocks with different rules. The row g^{ra} contains the coefficient estimates for the rational rule of Equation (3). The row g^r contains the coefficient estimates for one of the peak rules in Equations (4) and (5) as indicated in the heading. The abbreviations stand for ra: rational; sp: single peak; mp: multi-period peak; sb: single bottom; mb: multi-period bottom. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. Superscripts ***,**,* indicate significance at the 1%, 5% and 10% level. The rows "R^2" give the adjusted R^2.

Table B.4: Tests Results of the Peak Rules applied to financial variables: BAMLCC

(e) BAMLCC, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	0.06	0.06		0.30	−0.18		1.48***	0.94*		−0.31	−0.28		−0.43	−0.22
	(0.32)	(0.25)		(0.29)	(0.27)		(0.41)	(0.54)		(0.24)	(0.28)		(0.27)	(0.35)
g^r			−2.34***	−2.67***	2.72	−0.54*	−2.00***	−1.23	3.58***	3.98***	3.67*	1.81***	2.23***	1.31
			(0.58)	(0.51)	(1.87)	(0.31)	(0.48)	(0.78)	(0.81)	(0.88)	(1.88)	(0.49)	(0.57)	(1.05)
vol.		−2.06***			−3.56***			−0.91			−0.20			−0.93
		(0.48)			(1.36)			(0.80)			(0.88)			(0.75)
R^2	0.00	0.16	0.08	0.10	0.18	0.04	0.17	0.17	0.18	0.19	0.19	0.14	0.16	0.17

(f) BAMLCC, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	0.36	0.31		0.48*	0.31		1.16***	0.47		0.12	0.23		0.02	0.33
	(0.30)	(0.22)		(0.25)	(0.26)		(0.21)	(0.44)		(0.23)	(0.26)		(0.28)	(0.28)
g^r			−1.71**	−2.02***	0.03	−0.04	−1.22***	−0.22	3.17***	2.97***	1.26	1.41***	1.39***	−0.06
			(0.69)	(0.52)	(1.94)	(0.30)	(0.33)	(0.69)	(0.91)	(1.02)	(2.18)	(0.33)	(0.46)	(0.75)
vol.		−1.44***			−1.47			−1.23			−0.88			−1.50**
		(0.42)			(1.42)			(0.92)			(0.92)			(0.67)
R^2	0.06	0.26	0.13	0.24	0.26	−0.01	0.23	0.26	0.25	0.25	0.26	0.22	0.22	0.26

(g) BAMLCC, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−0.56	−0.57		−0.67	−0.97*		0.42	0.62		−0.67	−0.73		−0.79*	−1.09**
	(0.38)	(0.38)		(0.46)	(0.57)		(0.74)	(0.75)		(0.42)	(0.44)		(0.46)	(0.55)
g^r			−2.17	1.45	5.03	−0.78*	−1.27	−1.51	−1.38	1.38	2.26	−0.32	1.31	3.34
			(2.22)	(2.87)	(5.29)	(0.45)	(0.94)	(0.95)	(3.07)	(3.25)	(4.81)	(1.17)	(1.41)	(2.22)
vol.		−0.42			−2.29			0.64			0.67			3.05
		(1.74)			(3.10)			(1.97)			(2.32)			(2.66)
R^2	0.07	0.06	0.01	0.07	0.08	0.09	0.09	0.09	0.00	0.07	0.07	0.00	0.09	0.10

(h) BAMLCC, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−0.29	−0.65		0.64	0.13		2.57***	1.28		−1.18	0.47		−1.56**	−0.20
	(1.01)	(0.64)		(0.55)	(0.61)		(0.69)	(1.76)		(0.74)	(1.00)		(0.70)	(1.43)
g^r			−13.91***	−15.89***	−9.91	−1.69**	−4.39***	−2.65	3.61***	4.89***	−9.74	2.54***	4.17***	−2.01
			(3.43)	(3.08)	(6.23)	(0.75)	(0.72)	(2.31)	(1.20)	(1.40)	(6.77)	(0.93)	(0.95)	(5.66)
vol.		−4.45***			−1.91			−1.96			−12.65**			−6.49
		(0.95)			(1.80)			(2.55)			(5.55)			(5.85)
R^2	0.00	0.27	0.26	0.28	0.29	0.13	0.28	0.29	0.16	0.24	0.29	0.14	0.26	0.27

This table shows the results of regressions of $PAGO_t$ on changes in the log of the ICE BofA US Corporate Index over the past year that have been transformed based on different rules. See the table note below the first panels for more information.

Table B.4: Tests Results of the Peak Rules applied to financial variables: UST3M

(i) UST3M, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	1.61	1.31		2.34**	2.61*		3.39***	2.92		0.73	2.18		−0.29	0.06
	(1.21)	(0.99)		(0.95)	(1.39)		(1.02)	(1.87)		(1.09)	(1.38)		(1.03)	(1.29)
g^r			−9.50***	−11.10***	−13.91	−2.41**	−4.36***	−3.40	6.60***	6.15***	−8.65	3.77***	3.93***	3.06
			(2.15)	(2.50)	(8.98)	(1.05)	(0.97)	(3.07)	(1.15)	(1.24)	(6.19)	(0.80)	(0.82)	(3.18)
vol.		−4.32***			1.23			−1.03			−9.72**			−1.01
		(0.83)			(3.54)			(2.64)			(4.27)			(3.25)
R^2	0.03	0.13	0.09	0.15	0.14	0.04	0.13	0.13	0.11	0.11	0.14	0.13	0.13	0.13

(j) UST3M, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−0.25	−0.42		0.71	0.68		2.02**	1.67		−1.14	−0.25		−2.06**	−1.01
	(1.08)	(0.86)		(0.72)	(0.72)		(0.81)	(1.13)		(0.88)	(0.89)		(0.89)	(1.03)
g^r			−11.61***	−12.18***	−11.89*	−3.82***	−5.10***	−4.36*	6.38***	6.96***	−1.60	3.31***	4.37***	1.58
			(2.20)	(2.05)	(6.60)	(0.87)	(0.73)	(2.25)	(1.02)	(1.13)	(2.76)	(0.69)	(0.72)	(3.15)
vol.		−4.78***			−0.13			−0.75			−5.81***			−3.11
		(0.71)			(2.47)			(2.24)			(2.12)			(3.59)
R^2	0.00	0.40	0.44	0.45	0.45	0.34	0.43	0.43	0.33	0.37	0.40	0.29	0.40	0.40

(k) UST3M, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	1.88*	2.70*		1.13	2.96		3.52**	8.75**		4.58**	5.07*		0.16	−1.70
	(1.10)	(1.50)		(1.70)	(3.64)		(1.67)	(3.37)		(2.32)	(2.79)		(2.86)	(3.08)
g^r			20.19	13.35	−2.59	1.72	−4.09	−11.60**	3.74	−19.24	−26.31	3.21**	2.99	9.71
			(12.98)	(19.88)	(33.49)	(2.58)	(3.99)	(5.63)	(8.63)	(14.10)	(28.58)	(1.37)	(4.02)	(6.06)
vol.		9.49			10.81			25.39**			−5.71			22.91*
		(9.69)			(14.29)			(10.78)			(18.64)			(11.72)
R^2	0.05	0.07	0.06	0.06	0.07	0.01	0.07	0.18	0.00	0.10	0.10	0.06	0.06	0.15

(l) UST3M, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	10.34***	19.89***		10.16**	22.34***		9.24**	18.19***		21.69***	21.32***		27.98***	26.00***
	(3.29)	(5.04)		(4.04)	(5.62)		(3.67)	(5.41)		(4.83)	(5.81)		(8.06)	(7.68)
g^r			−40.74	−4.28	−49.52**	23.21*	15.78	4.21	14.35	−37.98***	−43.05**	8.97**	−20.41**	−11.69
			(43.33)	(38.96)	(22.31)	(13.03)	(10.46)	(10.22)	(13.13)	(11.14)	(20.04)	(3.66)	(10.08)	(11.06)
vol.		27.49*			40.55***			23.45			−5.44			15.98
		(14.74)			(12.33)			(15.84)			(26.56)			(17.46)
R^2	0.24	0.30	0.04	0.23	0.34	0.10	0.28	0.30	0.05	0.35	0.34	0.14	0.30	0.31

This table shows the results of regressions of $PAGO_t$ on changes in the 3-month T-bill rate over the past year that have been transformed based on different rules. See the table note below the first panels for more information.

Table B.4: Tests Results of the Peak Rules applied to financial variables: UST10Y

(m) UST10Y, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−0.18	0.00		1.68	−0.68		3.52**	−1.74		−1.93	−2.93*		−3.55**	2.06
	(1.52)	(1.22)		(1.30)	(1.72)		(1.77)	(2.17)		(1.22)	(1.73)		(1.42)	(2.32)
g^r			−16.60***	−19.99***	7.81	−4.40**	−8.49***	4.14	18.14***	20.32***	30.60**	4.21*	7.80***	−4.59
			(5.36)	(5.57)	(17.41)	(2.22)	(2.69)	(4.57)	(4.40)	(4.33)	(15.04)	(2.18)	(2.07)	(4.68)
vol.		−11.30***			−14.62*			−15.12***			7.11			−16.33***
		(2.35)			(7.85)			(4.49)			(9.29)			(6.05)
R^2	0.00	0.11	0.07	0.08	0.11	0.04	0.07	0.12	0.14	0.15	0.16	0.04	0.08	0.12

(n) UST10Y, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−1.79	−1.71		−0.44	−1.58		0.80	−2.65		−2.91**	−2.97**		−4.24***	−0.45
	(1.56)	(1.19)		(1.36)	(1.46)		(1.90)	(1.86)		(1.18)	(1.27)		(1.42)	(1.80)
g^r			−16.31***	−15.37**	−1.55	−5.14**	−6.17**	2.28	9.84**	13.51***	14.18	0.91	5.58**	−2.81
			(5.29)	(6.12)	(13.60)	(2.13)	(3.04)	(3.96)	(4.11)	(3.82)	(9.73)	(2.31)	(2.28)	(3.44)
vol.		−8.03***			−7.36			−10.00***			0.46			−11.05***
		(2.86)			(6.21)			(3.21)			(7.54)			(4.21)
R^2	0.05	0.21	0.19	0.19	0.21	0.15	0.15	0.21	0.11	0.24	0.23	0.00	0.16	0.21

(o) UST10Y, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	2.00	2.07		3.81*	5.30**		3.71	3.69		3.40	5.67*		1.10	1.41
	(2.10)	(2.06)		(2.28)	(2.23)		(3.09)	(3.06)		(3.00)	(3.40)		(3.22)	(3.23)
g^r			−9.83	−24.20*	−53.08***	2.63	−3.73	−3.66	0.68	−18.17	−41.69	4.11	2.12	1.49
			(12.05)	(14.39)	(18.37)	(4.33)	(6.48)	(6.35)	(15.76)	(21.13)	(28.71)	(3.64)	(4.53)	(4.93)
vol.		−2.91			27.31**			−0.19			−18.74			−1.89
		(11.09)			(11.58)			(11.64)			(15.77)			(12.53)
R^2	0.03	0.02	0.01	0.09	0.14	0.01	0.03	0.02	−0.01	0.04	0.07	0.03	0.02	0.02

(p) UST10Y, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	6.71	−0.94		17.45***	2.96		22.83***	−1.45		−6.01	4.90		−21.87***	−0.62
	(5.86)	(4.47)		(4.59)	(4.02)		(5.46)	(10.59)		(5.70)	(4.35)		(6.90)	(5.75)
g^r			−67.83***	−124.45***	−31.05*	−17.11	−49.89***	1.17	49.61***	60.10***	−50.31**	20.75***	47.87***	−0.66
			(24.18)	(26.89)	(17.55)	(10.47)	(8.11)	(18.12)	(7.90)	(9.31)	(22.80)	(7.62)	(6.53)	(11.96)
vol.		−64.48***			−54.22***			−65.58***			−105.04***			−65.09***
		(8.05)			(6.43)			(19.21)			(22.04)			(15.74)
R^2	0.04	0.51	0.13	0.37	0.51	0.07	0.38	0.51	0.33	0.35	0.54	0.23	0.36	0.51

This table shows the results of regressions of $PAGO_t$ on changes in the 10-year government bond yield over the past year that have been transformed based on different rules. See the table note below the first panels for more information.

Table B.4: Tests Results of the Peak Rules applied to financial variables: HPIQ

(q) HPIQ, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	1.92***	1.42***		4.79***	3.07***		7.38***	5.24***		−1.55	1.54*		−2.39***	−1.60
	(0.63)	(0.48)		(0.61)	(0.87)		(0.63)	(0.85)		(1.06)	(0.86)		(0.79)	(0.99)
g^r			2.10	−13.31***	−6.65*	1.49*	−7.83***	−5.18***	7.83***	12.30***	−0.51	5.60***	10.12***	7.90***
			(2.42)	(2.59)	(3.91)	(0.88)	(1.13)	(1.39)	(1.54)	(3.07)	(3.46)	(0.61)	(1.32)	(1.88)
vol.		−8.56***			−4.83**			−4.98***			−8.82***			−2.55
		(1.80)			(2.28)			(1.50)			(2.64)			(1.93)
R^2	0.22	0.44	0.02	0.43	0.45	0.07	0.46	0.50	0.36	0.38	0.44	0.42	0.49	0.49

(r) HPIQ, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−0.32	−0.43		1.96***	1.01		6.87***	0.87		−2.03**	0.80*		−2.72***	−0.25
	(0.70)	(0.57)		(0.70)	(0.99)		(1.74)	(2.15)		(1.00)	(0.47)		(0.98)	(1.22)
g^r			−4.85**	−9.49***	−5.78	−0.61	−7.81***	−1.41	2.20	6.99**	−5.31	2.48	8.61***	−0.69
			(1.91)	(2.73)	(4.74)	(0.66)	(2.09)	(2.50)	(2.49)	(3.30)	(3.38)	(2.16)	(2.61)	(5.22)
vol.		−5.74***			−2.66			−5.26**			−8.63***			−6.15*
		(1.74)			(2.73)			(2.07)			(2.34)			(3.58)
R^2	0.00	0.24	0.15	0.25	0.26	0.02	0.12	0.24	0.03	0.13	0.25	0.04	0.22	0.24

(s) HPIQ, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	0.11	0.83		3.87*	2.78*		43.42	−29.08		−1.85	2.60*		−2.76	3.57
	(0.54)	(0.71)		(2.01)	(1.57)		(48.07)	(61.62)		(1.58)	(1.32)		(1.75)	(2.62)
g^r			−1.23	−12.29**	−7.49	0.11	−43.36	29.98	1.73	8.82	−6.80	2.02	12.65	−10.27
			(1.64)	(5.95)	(5.17)	(0.54)	(48.41)	(62.04)	(2.61)	(7.52)	(5.48)	(2.61)	(8.26)	(10.16)
vol.		−9.41*			−4.91			−9.74*			−12.67**			−14.73**
		(5.18)			(5.22)			(5.39)			(5.02)			(7.29)
R^2	−0.01	0.10	0.00	0.11	0.12	−0.01	−0.01	0.10	0.00	0.03	0.11	0.01	0.06	0.11

(t) HPIQ, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	3.72***	2.96***		5.45***	1.91*		6.48***	3.75***		0.13	2.03*		0.61	2.53**
	(0.60)	(0.34)		(0.62)	(1.04)		(1.03)	(1.31)		(1.23)	(1.09)		(1.40)	(1.07)
g^r			13.16**	−9.48***	4.40	5.34***	−5.12**	−1.25	12.08***	11.69***	3.59	6.89***	5.86**	0.95
			(5.05)	(3.18)	(3.68)	(1.91)	(1.99)	(2.17)	(1.11)	(3.60)	(4.10)	(0.56)	(2.30)	(1.90)
vol.		−7.63***			−10.06***			−6.39***			−5.92**			−6.85***
		(1.70)			(2.77)			(2.28)			(2.66)			(1.90)
R^2	0.68	0.76	0.38	0.73	0.76	0.47	0.74	0.76	0.75	0.75	0.76	0.73	0.73	0.76

This table shows the results of regressions of $PAGO_t$ on changes in the log of the All-Transactions House Price Index over the past year that have been transformed based on different rules. See the table note below the first panels for more information.

Table B.5: Tests Results of the Peak Rules applied to macro variables: CPI

(a) CPI, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−1.94***	−2.18***		1.17	−3.09*		12.77***	3.99		−4.73***	−3.36***		−4.13***	−3.12***
	(0.72)	(0.40)		(1.38)	(1.59)		(2.28)	(2.97)		(0.67)	(1.26)		(0.50)	(0.80)
g^r			−29.37***	−37.40***	10.33	−2.64***	−15.91***	−6.60**	8.27	29.98***	13.83	6.48	16.09***	7.65
			(5.22)	(13.31)	(17.28)	(0.45)	(2.46)	(3.17)	(8.43)	(5.86)	(13.37)	(4.03)	(2.24)	(5.77)
vol.		−20.29***			−24.37***			−14.54***			−11.51			−11.70
		(4.11)			(7.64)			(4.41)			(9.27)			(7.75)
R^2	0.09	0.34	0.25	0.26	0.34	0.15	0.30	0.35	0.03	0.33	0.34	0.06	0.33	0.35

(b) CPI, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−3.25***	−3.01***		−1.09	−2.02		−1.70	−12.16**		−4.34***	−2.82***		−3.95***	−1.97***
	(0.35)	(0.36)		(0.82)	(1.22)		(5.05)	(4.70)		(0.59)	(0.62)		(0.57)	(0.57)
g^r			−31.85***	−23.07***	−11.70	−3.31***	−1.59	9.39*	−16.49**	16.15***	−2.42	−12.79***	8.01*	−10.09**
			(3.89)	(8.64)	(13.03)	(0.38)	(5.38)	(5.05)	(7.30)	(6.02)	(9.94)	(4.24)	(4.73)	(4.32)
vol.		−12.09***			−6.97			−14.21***			−13.45			−19.76***
		(3.87)			(6.32)			(3.79)			(8.25)			(5.53)
R^2	0.55	0.63	0.62	0.63	0.64	0.55	0.55	0.64	0.12	0.61	0.63	0.14	0.58	0.64

(c) CPI, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−2.79	−2.09		−2.58	−6.40		6.81	5.28		−3.04	−7.28**		−3.39	−9.60***
	(3.12)	(3.16)		(4.02)	(4.16)		(8.17)	(7.98)		(2.70)	(3.52)		(2.60)	(3.49)
g^r			−6.00	−1.05	38.09*	−3.41	−10.22	−8.26	14.47*	15.23	51.21**	12.68*	14.23*	53.21***
			(7.22)	(9.10)	(20.54)	(3.13)	(8.28)	(9.23)	(8.49)	(9.56)	(21.53)	(7.12)	(8.44)	(19.28)
vol.		−4.49			−24.87**			−1.98			23.48*			29.44**
		(4.95)			(12.23)			(5.75)			(11.96)			(12.26)
R^2	0.03	0.04	0.01	0.02	0.10	0.04	0.05	0.05	0.06	0.09	0.16	0.06	0.10	0.21

(d) CPI, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−0.11	−4.39**		2.57	1.92		11.18***	−2.56		−7.39**	−1.11		−8.05***	−1.85
	(3.66)	(2.16)		(2.08)	(5.14)		(2.77)	(5.27)		(2.98)	(4.13)		(3.06)	(3.79)
g^r			−73.07***	−77.58***	−71.03*	−7.34**	−18.97***	−2.36	20.91***	35.60***	−32.50	10.15***	18.31***	−11.13
			(12.58)	(12.29)	(39.89)	(3.20)	(4.39)	(6.81)	(6.90)	(9.53)	(27.06)	(3.14)	(4.23)	(11.08)
vol.		−27.40***			−2.74			−24.69**			−49.02***			−42.03***
		(5.35)			(15.43)			(9.97)			(17.72)			(15.62)
R^2	−0.01	0.33	0.37	0.39	0.39	0.10	0.27	0.33	0.16	0.27	0.35	0.15	0.28	0.34

This table shows the results of regressions of $PAGO_t$ on changes in the log of Consumer Price Index over the past year that have been transformed based on different rules. In each panel a different subperiod is described. The column headings indicate which rule is used. The row g^{ra} contains the coefficient estimates for the rational rule of Equation (3). The row g^r contains the coefficient estimates for one of the peak rules in Equations (4) and (5) as indicated by the column. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. The abbreviations stand for ra: rational; sp: single peak; mp: multi-period peak; sb: single bottom; mb: multi-period bottom. Superscripts ***,** ,* indicate significance at the 1%, 5% and 10% level. The rows "R^2" give the adjusted R^2.

Table B.5: Tests Results of the Peak Rules applied to macro variables: GNP

(e) GNP, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	0.60	0.67		0.39	0.05		0.14	0.58		0.74	−0.87		0.73	−2.66
	(0.83)	(0.89)		(0.72)	(1.24)		(0.65)	(2.68)		(1.12)	(1.74)		(1.13)	(2.49)
g^r			1.40	1.00	2.11	0.76	0.63	0.12	0.46	−0.37	5.46	0.47	−0.31	10.45
			(1.51)	(1.12)	(2.86)	(0.98)	(0.89)	(3.11)	(0.91)	(1.11)	(4.37)	(0.90)	(1.06)	(7.12)
vol.		0.46			−0.69			0.38			3.91			7.53
		(0.65)			(1.62)			(2.22)			(2.80)			(4.87)
R^2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.02	0.00	0.01	0.04

(f) GNP, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−0.86	−0.69		−0.52	−0.74					−1.73**	−2.84		−2.01**	−5.72*
	(0.95)	(1.19)		(1.78)	(1.70)					(0.85)	(2.05)		(0.91)	(2.92)
g^r			−1.99	−1.01	0.17	−0.86			0.86	5.13	9.14	0.50	5.95	19.16**
			(1.73)	(3.62)	(4.01)	(0.95)			(4.08)	(4.35)	(6.69)	(3.90)	(4.40)	(9.05)
vol.		−1.21			−1.31						3.20			8.51
		(3.04)			(3.40)						(4.58)			(6.14)
R^2	0.02	0.03	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.06	0.08	−0.01	0.07	0.13

(g) GNP, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	2.48***	2.38***		1.83**	1.43**		5.12	7.07		2.48***	1.30		2.69***	1.66
	(0.42)	(0.44)		(0.78)	(0.69)		(7.12)	(5.55)		(0.88)	(1.30)		(1.02)	(3.32)
g^r			4.34***	1.65	3.23*	2.56***	−2.75	−4.91	5.10**	−0.02	3.79	5.14**	−0.93	2.35
			(1.30)	(1.95)	(1.85)	(0.45)	(7.62)	(5.96)	(2.28)	(3.27)	(4.55)	(2.20)	(3.59)	(10.90)
vol.		0.61			−1.47			0.84			2.43			1.75
		(1.76)			(2.04)			(1.73)			(2.35)			(5.31)
R^2	0.19	0.19	0.16	0.20	0.20	0.19	0.19	0.19	0.08	0.19	0.19	0.08	0.19	0.19

(h) GNP, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	1.69	3.15*		1.86	4.50*		0.93	−3.12		4.24**	4.99		4.45*	9.02
	(1.80)	(1.87)		(1.60)	(2.69)		(1.22)	(6.23)		(2.13)	(3.54)		(2.27)	(7.45)
g^r			2.92*	3.17**	−3.82	3.81**	3.45**	9.17	−0.26	−3.26**	−5.65	−0.15	−3.14**	−14.70
			(1.58)	(1.48)	(5.45)	(1.85)	(1.43)	(9.54)	(0.87)	(1.34)	(9.57)	(0.86)	(1.31)	(17.08)
vol.		2.02**			4.18			−3.88			−1.55			−7.74
		(0.88)			(3.30)			(6.13)			(6.21)			(11.39)
R^2	0.04	0.10	0.05	0.09	0.10	0.12	0.12	0.13	0.00	0.11	0.10	−0.01	0.11	0.11

This table shows the results of regressions of $PAGO_t$ on changes in the log of the GNP over the past year that have been transformed based on different rules. See the table note below the first panels for more information.

Table B.5: Tests Results of the Peak Rules applied to macro variables: NFP

(i) NFP, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	2.66**	4.01***		2.74***	7.55***		2.07**	7.86***		4.56***	7.80***		4.64***	1.60
	(1.24)	(1.06)		(1.03)	(1.32)		(0.86)	(2.27)		(1.09)	(1.25)		(1.35)	(1.72)
g^r			3.52	4.39	−26.15***	3.73**	2.55***	−6.04*	0.15	−3.12***	−31.44***	1.15	−2.53***	6.71*
			(2.84)	(2.98)	(6.38)	(1.49)	(0.97)	(3.60)	(0.41)	(0.74)	(8.53)	(1.14)	(0.92)	(3.56)
vol.		2.42***			9.55***			6.82***			−25.21***			7.49***
		(0.70)			(1.78)			(2.57)			(7.62)			(2.62)
R^2	0.14	0.21	0.01	0.15	0.29	0.11	0.18	0.22	0.00	0.23	0.32	0.02	0.18	0.23

(j) NFP, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	2.74***	2.73***		5.09***	6.49***		4.36	4.09		4.33***	6.63***		3.49*	4.35*
	(0.90)	(0.91)		(1.16)	(1.20)		(2.90)	(3.39)		(0.73)	(1.05)		(1.80)	(2.52)
g^r			3.70	−25.22***	−39.77***	3.73**	−2.47	−2.06	4.09	−18.07***	−45.26***	6.20***	−2.22	−4.82
			(12.67)	(9.31)	(13.85)	(1.44)	(4.68)	(5.40)	(9.10)	(6.40)	(10.85)	(2.17)	(4.21)	(6.59)
vol.		−3.08			16.27			−2.28			−30.18***			−6.56
		(10.28)			(10.04)			(11.26)			(11.24)			(12.86)
R^2	0.17	0.16	0.00	0.28	0.32	0.14	0.17	0.16	0.00	0.23	0.37	0.12	0.16	0.17

(k) NFP, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	4.82***	5.09***		6.56***	5.41**		4.11	0.37		3.06**	5.21**		4.85**	7.82**
	(1.20)	(1.19)		(1.73)	(2.39)		(4.65)	(5.59)		(1.45)	(2.41)		(2.19)	(3.12)
g^r			11.32*	−13.24*	−2.80	6.13***	0.92	6.20	36.01***	17.00*	−1.13	16.38***	−0.15	−11.45
			(6.17)	(6.88)	(16.85)	(1.71)	(6.85)	(8.44)	(8.02)	(8.96)	(15.58)	(4.13)	(6.17)	(8.81)
vol.		−12.50**			−10.23			−14.17**			−12.92			−17.37**
		(5.70)			(13.64)			(6.10)			(8.89)			(7.02)
R^2	0.33	0.38	0.06	0.38	0.38	0.33	0.33	0.39	0.31	0.36	0.38	0.26	0.33	0.40

(l) NFP, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	2.30	5.63***		3.04**	11.89***		2.59**	7.71***		6.53***	10.68***		7.38**	3.52
	(1.74)	(1.74)		(1.51)	(2.01)		(1.23)	(2.86)		(1.68)	(1.72)		(2.91)	(3.93)
g^r			4.46	8.07**	−36.13***	4.35*	4.77**	−3.73	−0.29	−4.56***	−36.04***	0.46	−4.67**	4.66
			(3.01)	(3.49)	(8.36)	(2.37)	(1.92)	(6.15)	(0.44)	(1.16)	(8.82)	(0.91)	(1.85)	(6.24)
vol.		3.67***			14.24***			6.22*			−27.66***			6.94*
		(1.13)			(2.53)			(3.71)			(7.59)			(3.83)
R^2	0.10	0.29	0.03	0.19	0.46	0.13	0.26	0.30	0.00	0.33	0.44	0.00	0.26	0.30

This table shows the results of regressions of $PAGO_t$ on changes in the log of nonfarm payrolls over the past year that have been transformed based on different rules. See the table note below the first panels for more information.

Table B.5: Tests Results of the Peak Rules applied to macro variables: UNEMP

(m) UNEMP, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−4.24**	−5.62***		−6.24***	−10.17***		−5.51***	2.36		−4.30**	−9.64***		−4.14**	−14.17***
	(2.00)	(1.91)		(1.93)	(1.40)		(1.99)	(1.48)		(1.82)	(1.84)		(1.91)	(1.79)
g^r			−0.12	3.37***	44.82***	−2.08	1.43	−17.81***	−4.53	−5.51	36.25***	−1.73*	−1.16	16.73***
			(0.52)	(1.23)	(7.89)	(1.83)	(1.10)	(2.61)	(3.43)	(4.77)	(9.86)	(1.02)	(1.15)	(2.71)
vol.		2.50**			−37.51***			16.70***			10.51***			15.50***
		(1.09)			(6.88)			(2.03)			(2.19)			(2.17)
R^2	0.13	0.17	0.00	0.19	0.32	0.04	0.14	0.29	0.01	0.14	0.23	0.01	0.14	0.30

(n) UNEMP, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−7.46***	−6.18***		−6.36***	−6.95***		−5.17**	−9.03***		−8.04***	−5.37***		−8.47***	−4.36
	(1.07)	(0.92)		(1.52)	(1.60)		(2.61)	(3.20)		(1.23)	(1.36)		(2.21)	(2.95)
g^r			−33.30***	−11.22	14.52	−11.65***	−4.23	6.31	−23.99	12.15	−11.37	−10.41***	2.62	−3.94
			(9.41)	(11.53)	(17.38)	(2.01)	(4.68)	(6.92)	(19.12)	(14.94)	(16.02)	(2.68)	(4.41)	(5.70)
vol.		−16.59***			−25.18**			−23.92***			−20.07***			−20.57***
		(5.32)			(10.53)			(8.74)			(6.56)			(7.70)
R^2	0.39	0.45	0.22	0.41	0.46	0.36	0.40	0.46	0.04	0.40	0.46	0.19	0.40	0.46

(o) UNEMP, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−6.50***	−5.06**		−0.51	0.26		6.14	6.17		−5.62**	2.71		−13.49***	−13.09***
	(2.21)	(2.17)		(2.65)	(2.82)		(4.73)	(5.94)		(2.63)	(2.90)		(3.80)	(4.63)
g^r			−53.95***	−51.87***	−65.47***	−13.54***	−22.05***	−22.11*	−31.50	−13.09	−77.08***	−1.42	22.77***	21.93**
			(15.86)	(18.39)	(23.78)	(4.32)	(8.36)	(11.57)	(23.44)	(27.22)	(21.34)	(6.98)	(8.71)	(10.74)
vol.		−18.85			10.39			0.14			−52.58***			−1.88
		(13.27)			(14.52)			(15.55)			(15.72)			(14.71)
R^2	0.12	0.16	0.24	0.24	0.24	0.22	0.24	0.24	0.06	0.12	0.30	0.00	0.24	0.23

(p) UNEMP, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−2.85	−4.89**		−5.65**	−12.55***		−5.00*	3.06**		−3.07	−11.66***		−2.86	−15.79***
	(2.21)	(2.32)		(2.41)	(2.00)		(2.69)	(1.50)		(2.00)	(3.01)		(2.03)	(2.62)
g^r			0.62	3.70**	57.38***	−0.78	2.16*	−18.39***	−5.96	−7.48	51.48***	−1.91	−1.92	19.79***
			(0.57)	(1.51)	(14.48)	(1.36)	(1.23)	(3.50)	(4.38)	(4.81)	(16.01)	(1.23)	(1.20)	(3.81)
vol.		2.89**			−47.82***			17.51***			14.63***			18.42***
		(1.30)			(12.84)			(2.60)			(3.76)			(2.95)
R^2	0.07	0.15	0.00	0.18	0.36	0.00	0.10	0.31	0.02	0.10	0.28	0.02	0.09	0.35

This table shows the results of regressions of $PAGO_t$ on changes in the unemployment rate over the past year that have been transformed based on different rules. See the table note below the first panels for more information.

Table B.5: Tests Results of the Peak Rules applied to macro variables: PCE

(q) PCE, Full period – January 1981 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	1.54*	1.68*		1.52*	1.76		1.25*	0.43		1.81*	1.85		1.79*	0.96
	(0.86)	(0.86)		(0.81)	(1.20)		(0.72)	(2.17)		(0.93)	(1.42)		(0.93)	(1.62)
g^r			1.21	1.03	−0.54	1.22*	0.63	1.76	0.39	−0.79	−1.07	0.38	−0.46	2.58
			(0.94)	(0.81)	(3.92)	(0.73)	(0.44)	(2.80)	(0.53)	(0.68)	(5.59)	(0.47)	(0.46)	(5.19)
vol.		0.54			0.79			−1.13			−0.20			3.15
		(0.45)			(2.03)			(2.77)			(3.80)			(5.30)
R^2	0.08	0.08	0.01	0.08	0.08	0.05	0.09	0.09	0.00	0.08	0.08	0.00	0.08	0.09

(r) PCE, First subperiod – January 1981 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	1.13	0.79		−0.33	−0.24		1.67	4.25**		1.29	−0.66		1.08	−1.53
	(1.45)	(1.44)		(2.08)	(2.13)		(2.24)	(2.02)		(1.48)	(2.33)		(1.60)	(2.09)
g^r			6.05**	6.64	5.61	1.10	−0.57	−3.75	−0.65	−1.83	9.43	1.58	0.60	14.57*
			(2.34)	(5.09)	(5.82)	(1.55)	(2.84)	(3.17)	(3.81)	(3.56)	(8.61)	(4.24)	(4.55)	(7.66)
vol.		3.35			1.27			4.23			9.39			12.59**
		(2.43)			(3.09)			(2.76)			(6.50)			(5.84)
R^2	0.03	0.07	0.11	0.11	0.10	0.02	0.02	0.08	−0.01	0.03	0.11	0.00	0.02	0.22

(s) PCE, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	3.31***	3.40***		3.78***	3.29***		6.79***	1.63		2.61**	3.31**		2.61**	3.30**
	(0.83)	(0.84)		(0.92)	(1.09)		(2.09)	(3.59)		(1.02)	(1.29)		(1.02)	(1.29)
g^r			−2.03	−5.34	1.50	3.30***	−3.78*	1.94	8.67***	5.51*	0.67	8.69***	5.54*	0.75
			(4.59)	(4.18)	(8.20)	(0.89)	(2.15)	(3.91)	(2.78)	(3.31)	(7.11)	(2.79)	(3.32)	(7.16)
vol.		−4.92*			−5.95			−5.39			−4.51			−4.46
		(2.78)			(5.26)			(3.50)			(5.87)			(5.90)
R^2	0.19	0.25	0.00	0.23	0.24	0.16	0.19	0.25	0.13	0.23	0.24	0.13	0.23	0.24

(t) PCE, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	1.38	1.77*		1.45	3.04*		1.20	−0.79		2.06*	3.67*		2.06*	2.39
	(1.02)	(1.06)		(0.98)	(1.72)		(0.92)	(3.92)		(1.16)	(2.13)		(1.14)	(2.90)
g^r			1.17	1.40	−7.44	1.07**	0.90**	3.90	−0.26	−1.37*	−10.78	−0.04	−0.83*	−1.81
			(0.86)	(0.89)	(4.99)	(0.52)	(0.45)	(5.54)	(0.51)	(0.73)	(8.25)	(0.41)	(0.44)	(9.06)
vol.		0.82*			4.30*			−2.94			−6.55			−1.00
		(0.48)			(2.45)			(5.69)			(5.58)			(9.44)
R^2	0.05	0.07	0.01	0.06	0.08	0.04	0.07	0.07	0.00	0.07	0.10	−0.01	0.07	0.06

This table shows the results of regressions of $PAGO_t$ on changes in the log of personal consumption expenditures over the past year that have been transformed based on different rules.See the table note below the first panels for more information.

Table B.6: End rule for Contemporaneous Macro Variables

(a) CPI

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	−3.17***		−3.56***	−2.92		−2.72	0.61		0.19
	(0.37)		(0.43)	(3.16)		(3.36)	(3.47)		(3.71)
g^{end}		−18.68***	4.69		−4.87	−1.56		6.47	6.27
		(5.37)	(3.77)		(4.44)	(4.16)		(6.11)	(6.41)
R^2	0.53	0.23	0.53	0.03	0.00	0.03	0.00	0.00	0.00

(b) NFP

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	2.93***		2.59***	4.81***		4.86***	2.42		2.45
	(0.88)		(0.95)	(1.21)		(1.29)	(1.72)		(1.78)
g^{end}		14.78***	4.46		18.94***	−0.72		1.62	−0.23
		(4.76)	(3.91)		(6.95)	(3.29)		(1.77)	(1.50)
R^2	0.19	0.09	0.19	0.33	0.09	0.33	0.11	0.00	0.11

(c) UNEMP

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	−7.66***		−7.47***	−6.14***		−6.62***	−2.97		−3.00
	(1.08)		(1.09)	(2.23)		(2.27)	(2.17)		(2.22)
g^{end}		−18.09***	−2.38		−1.40	5.92*		−1.79	0.27
		(3.49)	(3.33)		(4.05)	(3.03)		(1.98)	(1.78)
R^2	0.41	0.08	0.41	0.11	−0.01	0.11	0.08	0.00	0.08

(d) PCE

	Jan. 1981 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	1.03		1.05	3.19***		3.28***	1.54		1.54
	(1.46)		(1.51)	(0.89)		(0.88)	(0.99)		(1.02)
g^{end}		0.68	−0.13		1.67	−0.86		0.93	−0.03
		(1.05)	(1.07)		(1.52)	(1.00)		(0.87)	(0.84)
R^2	0.02	−0.01	0.01	0.17	0.00	0.17	0.06	0.00	0.05

This table shows the results of regressions of $PAGO_t$ on changes of macro variables over the past 11 months and the current month, $\Delta x_{j,t-11}, \ldots, \Delta x_{jt}$ that have been transformed based on the rational and the end-rule. The row g^{ra} contains the coefficient estimates for the rational rule of Equation (3). The row g^{end} contains the coefficient estimates for the end rules in Equation (5). For each financial variable and each sample period, we report the single regression with the rational rule, the single regression with the end rule and the multiple regression with both rules. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. Superscripts ***,**,* indicate significance at the 1%, 5% and 10% level. The row "R^2" gives the adjusted R^2. The sample period is from January 1978 to June 1992 for the first sample ($T = 174$), July 1992 to December 2006 for the second sample ($T = 174$) and January 2007 to Septemter 2021 for the third sample ($T = 177$).

Table B.7: Test Results for the Contemporaneous End Rule for Financial Variables

(a) S&P500

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	0.09		0.10	0.31^{***}		0.33^{***}	0.52^{***}		0.54^{***}
	(0.17)		(0.18)	(0.09)		(0.09)	(0.17)		(0.18)
g^{end}		0.04	−0.03		0.18	-0.29^{*}		0.24	−0.34
		(0.16)	(0.18)		(0.21)	(0.15)		(0.55)	(0.31)
R^2	0.00	−0.01	0.00	0.19	0.00	0.19	0.15	0.00	0.15

(b) BAMLCC

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	0.32		0.37	−0.55		−0.58	−0.38		−0.30
	(0.31)		(0.33)	(0.38)		(0.39)	(0.99)		(1.01)
g^{end}		0.00	−0.55		−0.36	0.42		−1.81	−1.53
		(0.49)	(0.43)		(0.78)	(0.68)		(1.80)	(1.71)
R^2	0.05	−0.01	0.05	0.06	0.00	0.06	0.01	0.01	0.01

(c) UST3M

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	−0.09		−0.19	1.75		2.23^{*}	9.29^{***}		11.33^{***}
	(1.10)		(1.14)	(1.08)		(1.23)	(3.51)		(3.66)
g^{end}		0.94	1.13		1.41	−7.12		5.75	-26.10^{**}
		(1.66)	(1.56)		(5.45)	(6.01)		(16.57)	(10.40)
R^2	−0.01	0.00	−0.01	0.04	−0.01	0.05	0.19	0.00	0.22

(d) UST10Y

	Jan. 1978 – Jun. 1992			Jul. 1992 – Dec. 2006			Jan. 2007 – Sept. 2021		
g^{ra}	−1.61		−1.79	1.79		2.05	5.79		6.13
	(1.59)		(1.68)	(2.11)		(2.19)	(6.02)		(5.93)
g^{end}		−0.58	2.13		−1.09	−3.60		1.37	−4.52
		(3.04)	(2.75)		(4.12)	(4.01)		(9.99)	(8.18)
R^2	0.04	−0.01	0.04	0.02	−0.01	0.02	0.03	−0.01	0.03

This table shows the results of regressions of $PAGO_t$ on changes of financial variables over the past 11 months and the current month, $\Delta x_{j,t-11}, \ldots, \Delta x_{jt}$ that have been transformed based on the rational and the end-rule. The row g^{ra} contains the coefficient estimates for the rational rule of Equation (3). The row g^{end} contains the coefficient estimates for the end rules in Equation (5). For each financial variable and each sample period, we report the single regression with the rational rule, the single regression with the end rule and the multiple regression with both rules. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. Superscripts ***,**,* indicate significance at the 1%, 5% and 10% level. The row "R^2" gives the adjusted R^2. The sample period is from January 1978 to June 1992 for the first sample ($T = 174$), July 1992 to December 2006 for the second sample ($T = 174$) and January 2007 to September 2021 for the third sample ($T = 177$).

Table B.8: Tests Results of the Peak and End Rules Applied to the S&P500 Depending on Investment in Stocks

(a) All respondents

rule	ra		sp			mp			st			mt			end		
g^{ra}	0.39**	0.18		0.38*	−0.11		0.71***	0.84**		0.03	0.00		−0.37	−0.58**		0.40**	0.16
	(0.20)	(0.24)		(0.20)	(0.26)		(0.15)	(0.32)		(0.26)	(0.27)		(0.31)	(0.27)		(0.20)	(0.25)
g^r			−1.17	−1.13	4.03*	−0.41	−1.23***	−1.45***	2.19***	2.11**	2.82	0.80***	1.20***	1.87***	0.35	−0.12	0.18
			(1.20)	(1.09)	(2.42)	(0.43)	(0.35)	(0.50)	(0.64)	(1.04)	(2.28)	(0.14)	(0.33)	(0.40)	(0.44)	(0.29)	(0.29)
vol.		−1.11*			−2.74**			0.37			0.46			1.11			−1.14*
		(0.60)			(1.13)			(0.81)			(1.31)			(0.78)			(0.62)
R^2	0.11	0.19	0.02	0.13	0.25	0.03	0.29	0.30	0.22	0.22	0.22	0.28	0.31	0.33	0.00	0.11	0.19

(b) Respondents with investment in stocks

rule	ra		sp			mp			st			mt			end		
g^{ra}	0.49**	0.26		0.49**	−0.04		0.85***	0.99***		0.09	0.04		−0.34	−0.57*		0.49**	0.22
	(0.21)	(0.25)		(0.21)	(0.28)		(0.15)	(0.34)		(0.27)	(0.28)		(0.33)	(0.29)		(0.21)	(0.26)
g^r			−1.36	−1.32	4.22	−0.39	−1.37***	−1.60***	2.62***	2.39**	3.43	0.95***	1.33***	2.04***	0.61	0.01	0.34
			(1.29)	(1.16)	(2.57)	(0.48)	(0.37)	(0.54)	(0.67)	(1.08)	(2.48)	(0.13)	(0.35)	(0.46)	(0.48)	(0.31)	(0.31)
vol.		−1.23*			−2.95**			0.40			0.68			1.19			−1.29**
		(0.63)			(1.21)			(0.85)			(1.43)			(0.85)			(0.65)
R^2	0.15	0.23	0.02	0.17	0.28	0.02	0.34	0.34	0.27	0.27	0.27	0.33	0.35	0.37	0.01	0.14	0.23

(c) Respondents without investment in stocks

rule	ra		sp			mp			st			mt			end		
g^{ra}	0.18	0.01		0.18	−0.28		0.48***	0.64**		−0.14	−0.20		−0.51*	−0.76***		0.21	0.02
	(0.20)	(0.23)		(0.20)	(0.24)		(0.16)	(0.32)		(0.24)	(0.24)		(0.28)	(0.24)		(0.20)	(0.24)
g^r			−0.81	−0.80	4.07*	−0.56	−1.11***	−1.39***	1.52**	1.89**	3.14	0.55***	1.10***	1.88***	−0.06	−0.32	−0.08
			(1.08)	(1.05)	(2.35)	(0.36)	(0.30)	(0.46)	(0.59)	(0.92)	(2.20)	(0.16)	(0.30)	(0.38)	(0.40)	(0.30)	(0.29)
vol.		−0.94*			−2.59**			0.48			0.82			1.30*			−0.92
		(0.55)			(1.03)			(0.79)			(1.30)			(0.76)			(0.56)
R^2	0.02	0.09	0.01	0.03	0.15	0.06	0.19	0.19	0.12	0.12	0.13	0.14	0.21	0.24	0.00	0.03	0.08

This table shows the results of regressions of $PAGO_t$ constructed for different groups of respondents on changes of the S&P500 index that have been transformed based on different rules. In panel (a) the dependent variable is $PAGO_t$ based on all respondents. In the other panels we construct the PAGO-series based on the group of respondents with or without investments in the stock market (panels b and c). We calculate the values for PAGO using the weights in the Michigan survey. The row g^{ra} contains the coefficient estimates for the rational rule of Equation (3). The row g^r contains the coefficient estimates for one of the peak-end rules in Equations (4) and (5) as indicated by the column. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. The abbreviations stand for ra: rational; sp: single peak; mp: multi-period peak; st: single trough; mb: multi-period rough. Superscripts $^{***}, ^{**}, ^{*}$ indicate significance at the 1%, 5% and 10% level. The rows "R^2" give the adjusted R^2. The sample period is from January 2000 to September 2021 ($T = 260$). Information about stock ownership is missing for all respondents in May 2003.

Table B.9: Tests Results of the Peak and End Rules Applied to the House Price index Depending on Home Ownership

(a) All respondents

rule	ra		sp			mp			st			mt			end		
g^{ra}	2.99***	2.31***		5.00***	2.66***		6.89***	5.91***		−0.17	2.40**		−0.53	0.36		3.71***	2.56***
	(0.41)	(0.25)		(0.58)	(0.83)		(0.85)	(1.59)		(0.76)	(1.09)		(0.73)	(1.02)		(0.52)	(0.48)
g^r			10.24***	−10.31***	−1.45	3.74***	−6.42***	−5.17**	9.85***	10.37***	−0.34	6.19***	7.16***	4.70**	7.62***	−2.72**	−0.84
			(2.83)	(2.45)	(3.32)	(0.98)	(1.38)	(2.34)	(0.99)	(2.45)	(4.33)	(0.40)	(1.42)	(2.24)	(1.50)	(1.32)	(1.06)
vol.		−7.47***			−6.67***			−2.39			−7.64***			−3.49			−7.23***
		(1.54)			(1.97)			(2.69)			(2.85)			(2.43)			(1.66)
R^2	0.57	0.65	0.31	0.63	0.65	0.37	0.68	0.68	0.62	0.62	0.65	0.66	0.66	0.66	0.35	0.58	0.65

(b) Respondents who own or are buying a house

rule	ra		sp			mp			st			mt			end		
g^{ra}	3.07***	2.38***		5.07***	2.67***		7.09***	6.23***		0.02	2.81**		−0.51	0.34		3.89***	2.74***
	(0.43)	(0.27)		(0.63)	(0.87)		(0.94)	(1.74)		(0.81)	(1.19)		(0.79)	(1.11)		(0.56)	(0.52)
g^r			10.56***	−10.29***	−1.16	3.84***	−6.61***	−5.52**	10.06***	10.01***	−1.65	6.35***	7.27***	4.92**	7.74***	−3.07**	−1.21
			(2.90)	(2.63)	(3.41)	(1.01)	(1.51)	(2.57)	(1.05)	(2.62)	(4.75)	(0.43)	(1.55)	(2.42)	(1.54)	(1.42)	(1.21)
vol.		−7.51***			−6.87***			−2.09			−8.31***			−3.35			−7.17***
		(1.65)			(2.08)			(2.88)			(3.13)			(2.54)			(1.77)
R^2	0.54	0.62	0.30	0.60	0.61	0.35	0.65	0.65	0.59	0.59	0.61	0.62	0.62	0.63	0.33	0.55	0.62

(c) Respondents who are renting

rule	ra		sp			mp			st			mt			end		
g^{ra}	2.76***	2.12***		4.78***	3.01***		6.14***	4.78***		−0.61	1.15		−0.34	0.73		3.07***	1.91***
	(0.37)	(0.24)		(0.53)	(0.88)		(0.78)	(1.32)		(0.72)	(0.97)		(0.71)	(0.92)		(0.44)	(0.41)
g^r			9.31***	−10.35***	−3.62	3.51***	−5.55***	−3.81**	9.23***	11.09***	3.75	5.70***	6.32***	3.36	7.40***	−1.16	0.73
			(2.63)	(2.42)	(3.77)	(0.90)	(1.25)	(1.93)	(0.83)	(2.38)	(3.83)	(0.39)	(1.39)	(2.09)	(1.42)	(1.38)	(0.95)
vol.		−7.06***			−5.07**			−3.32			−5.24**			−4.23*			−7.27***
		(1.46)			(2.04)			(2.37)			(2.45)			(2.38)			(1.51)
R^2	0.49	0.56	0.26	0.55	0.56	0.32	0.57	0.57	0.55	0.55	0.56	0.56	0.55	0.56	0.33	0.49	0.56

This table shows the results of regressions of $PAGO_t$ constructed for different groups of respondents on changes of the house price index that have been transformed based on different rules. In panel (a) the dependent variable is $PAGO_t$ based on all respondents. In the other panels we construct the PAGO-series based on the group of respondents who own or are buying a house or those who are renting (panels b and c). The sample period is from January 2000 to September 2021 ($T = 261$). See Table B.8 for further information.

Table B.10: Tests Results of the Peak and End Rules Applied to the Unemployment Rate Depending on Job Perspective

(a) All respondents

rule	ra		sp			mp			st			mt			end		
g^{ra}	−3.30	−4.81*		−5.51**	−12.33***		−4.38	4.49***		−3.43	−10.86***		−3.30	−16.78***		−3.34	−5.03*
	(2.25)	(2.60)		(2.74)	(1.92)		(2.66)	(1.43)		(2.16)	(3.16)		(2.18)	(2.19)		(2.30)	(2.75)
g^r			0.02	3.01*	58.54***	−1.46	1.10	−21.32***	−3.11	−4.75	47.21***	−0.82	−0.83	22.16***	−1.84	0.48	1.49
			(0.45)	(1.62)	(12.70)	(1.50)	(1.10)	(2.86)	(3.57)	(4.70)	(15.57)	(0.93)	(1.10)	(3.24)	(2.11)	(1.78)	(1.55)
vol.		2.21			−49.45***			19.27***			12.97***			19.65***			2.30
		(1.35)			(11.12)			(2.25)			(3.81)			(2.59)			(1.43)
R^2	0.08	0.12	0.00	0.14	0.32	0.03	0.09	0.29	0.00	0.09	0.21	0.00	0.08	0.33	0.00	0.08	0.12

(b) Probability of losing a job: 0%

rule	ra		sp			mp			st			mt			end		
g^{ra}	−2.19	−4.27*		−5.03**	−10.93***		−4.35*	4.12***		−2.44	−9.25***		−2.19	−15.15***		−2.16	−4.42*
	(2.24)	(2.25)		(2.33)	(1.83)		(2.43)	(1.35)		(1.97)	(2.98)		(2.04)	(2.21)		(2.31)	(2.38)
g^r			1.14***	3.87***	51.85***	−0.36	2.19**	−19.22***	−7.57**	−8.73**	38.84**	−1.94**	−1.94*	20.16***	−1.79	−0.28	1.07
			(0.42)	(1.40)	(13.06)	(1.44)	(1.04)	(2.86)	(3.19)	(4.41)	(15.18)	(0.85)	(1.05)	(3.27)	(1.93)	(1.81)	(1.23)
vol.		3.02**			−42.74***			18.41***			11.87***			18.89***			3.08**
		(1.19)			(11.50)			(2.26)			(3.65)			(2.60)			(1.25)
R^2	0.04	0.11	0.01	0.13	0.27	0.00	0.06	0.26	0.02	0.07	0.17	0.02	0.05	0.29	0.00	0.03	0.11

(c) Probability of losing a job: 1–49%

rule	ra		sp			mp			st			mt			end		
g^{ra}	−4.08*	−5.31*		−5.98**	−13.26***		−4.65	4.22***		−4.15*	−11.95***		−4.08*	−17.53***		−4.17*	−5.56*
	(2.28)	(2.79)		(2.96)	(1.99)		(2.82)	(1.37)		(2.27)	(3.23)		(2.26)	(2.12)		(2.32)	(2.95)
g^r			−0.66	2.58	61.88***	−2.14	0.58	−21.85***	−0.72	−2.70	51.83***	−0.31	−0.31	22.63***	−1.98	0.92	1.76
			(0.45)	(1.76)	(12.65)	(1.53)	(1.13)	(2.65)	(3.97)	(4.86)	(15.42)	(1.03)	(1.10)	(2.94)	(2.36)	(1.89)	(1.83)
vol.		1.80			−52.81***			19.28***			13.61***			19.61***			1.90
		(1.45)			(11.02)			(2.11)			(3.85)			(2.42)			(1.54)
R^2	0.12	0.14	0.00	0.15	0.34	0.05	0.11	0.30	0.00	0.12	0.23	0.00	0.11	0.34	0.00	0.11	0.14

(d) Probability of losing a job: 50–100%

rule	ra		sp			mp			st			mt			end		
g^{ra}	−3.94*	−4.53		−5.06	−12.37***		−3.34	5.67***		−3.91*	−10.92***		−3.94*	−17.69***		−4.06*	−4.76
	(2.15)	(2.88)		(3.10)	(2.06)		(2.77)	(1.73)		(2.25)	(3.32)		(2.22)	(2.42)		(2.19)	(3.05)
g^r			−1.22***	1.53	61.03***	−2.56*	−0.61	−23.40***	2.72	0.86	49.87***	0.92	0.91	24.36***	−1.67	1.15	1.57
			(0.46)	(1.80)	(11.33)	(1.45)	(1.16)	(3.36)	(3.92)	(5.04)	(16.26)	(1.04)	(1.16)	(3.76)	(2.19)	(1.60)	(1.82)
vol.		0.87			−53.00***			19.59***			12.23***			20.05***			0.96
		(1.48)			(9.81)			(2.63)			(3.99)			(2.99)			(1.58)
R^2	0.10	0.10	0.01	0.11	0.28	0.07	0.10	0.27	0.00	0.09	0.18	0.00	0.10	0.31	0.00	0.10	0.10

This table shows the results of regressions of $PAGO_t$ constructed for different groups of respondents on changes of the unemployment rate that have been transformed based on different rules. In panel (a) the dependent variable is $PAGO_t$ based on all respondents. In the other panels, we group respondents based on the probability (in %) they report for losing their job in the next five years (variable PJOB in the CAB survey). The sample period is from December 1997 to September 2021 ($T = 286$). See Table B.8 for further information.

Table B.11: Tests Results of the Peak Rules applied to Unemployment: South

(a) South, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−4.77**	−6.03***		−6.58***	−11.85***		−5.65**	3.46**		−4.75**	−9.96***		−4.63**	−16.99***
	(2.15)	(2.16)		(2.23)	(2.53)		(2.19)	(1.56)		(1.94)	(2.94)		(2.12)	(2.13)
g^r			−0.41	3.33**	50.58***	−2.66	1.01	−19.57***	−7.59	−7.32	36.68**	−2.04	−0.93	20.76***
			(0.62)	(1.46)	(13.52)	(2.14)	(1.33)	(3.01)	(5.21)	(5.97)	(14.46)	(1.34)	(1.36)	(3.14)
vol.		2.60**			−41.82***			18.01***			10.49***			18.97***
		(1.29)			(11.35)			(2.39)			(3.29)			(2.51)
R^2	0.12	0.15	0.00	0.16	0.22	0.05	0.12	0.27	0.01	0.13	0.18	0.01	0.12	0.28

(b) South, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
ra	ra_vol	sp	sp_ra	sp_vol	mp	mp_ra	mp_vol	sb	sb_ra	sb_vol	mb	mb_ra	mb_vol	
g^{ra}	−7.30***	−6.87***		−3.27	0.86		−6.75**	−8.41**		−6.91***	0.06		−7.94***	−5.24*
	(1.20)	(0.96)		(2.21)	(3.90)		(2.80)	(3.29)		(2.37)	(2.39)		(2.85)	(3.10)
g^r			−63.20***	−40.02	−91.51*	−10.80***	−1.03	3.17	−71.63***	−5.35	−83.00***	−10.98***	1.33	−3.11
			(12.60)	(24.88)	(46.73)	(2.40)	(4.94)	(5.86)	(12.61)	(22.64)	(27.39)	(3.01)	(5.08)	(6.17)
vol.		−15.58			37.56			−21.03			−47.78***			−21.05
		(14.17)			(26.92)			(17.07)			(17.62)			(17.36)
R^2	0.32	0.33	0.35	0.36	0.37	0.26	0.32	0.33	0.23	0.32	0.37	0.22	0.32	0.33

(c) South, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−5.26**	−3.65*		−0.56	−5.82		7.38	1.35		−7.75**	−0.35		−15.00***	−10.45**
	(2.16)	(2.16)		(2.48)	(4.22)		(7.01)	(8.90)		(3.22)	(4.89)		(5.06)	(4.59)
g^r			−39.71***	−37.96***	23.96	−10.63***	−20.67*	−8.72	3.31	39.55**	−40.91	−1.41	25.51**	16.57
			(10.33)	(11.61)	(30.79)	(3.88)	(10.56)	(13.12)	(20.50)	(17.57)	(38.86)	(6.68)	(10.72)	(11.55)
vol.		−40.98***			−61.37**			−32.44**			−59.49***			−28.89***
		(11.25)			(29.19)			(14.66)			(21.46)			(10.73)
R^2	0.05	0.15	0.12	0.12	0.15	0.10	0.11	0.15	−0.01	0.08	0.15	0.00	0.14	0.17

(d) South, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−3.55	−5.63**		−6.34**	−11.98***		−5.59*	4.34**		−3.74*	−10.31**		−3.44	−18.19***
	(2.52)	(2.53)		(2.61)	(3.03)		(2.93)	(1.77)		(2.19)	(3.97)		(2.29)	(3.08)
g^r			0.53	4.06**	47.99***	−1.26	2.13	−21.47***	−8.96	−10.27*	38.44**	−2.36	−2.09	22.72***
			(0.68)	(1.70)	(16.34)	(1.75)	(1.41)	(4.41)	(5.53)	(5.97)	(19.18)	(1.57)	(1.42)	(4.63)
vol.		3.27**			−38.61***			20.14***			11.78**			21.21***
		(1.49)			(13.95)			(3.26)			(4.69)			(3.45)
R^2	0.08	0.15	0.00	0.17	0.24	0.01	0.10	0.32	0.02	0.12	0.20	0.02	0.10	0.34

This table shows the results of regressions of $PAGO_t$ constructed for different regions on changes in the regional unemployment rate over the past year that have been transformed based on different rules. See Table B.5 for more information.

Table B.11: Tests Results of the Peak Rules applied to Unemployment: West

(e) West, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−4.02**	−5.37***		−5.83***	−9.14***		−4.69***	3.48***		−4.06***	−9.52***		−3.92**	−15.14***
	(1.77)	(1.72)		(1.79)	(2.24)		(1.72)	(1.27)		(1.53)	(2.33)		(1.74)	(2.06)
g^r			−0.64	3.23**	34.90***	−2.62	0.76	−18.16***	−7.27	−7.90*	40.49***	−1.91	−0.80	18.54***
			(0.48)	(1.38)	(10.89)	(1.82)	(1.11)	(2.86)	(6.09)	(4.76)	(11.62)	(1.39)	(1.11)	(3.03)
vol.		2.65**			−28.19***			16.50***			11.18***			16.94***
		(1.23)			(9.02)			(2.35)			(2.96)			(2.49)
R^2	0.13	0.17	0.00	0.18	0.21	0.07	0.13	0.33	0.01	0.15	0.21	0.01	0.13	0.33

(f) West, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−5.18***	−4.56***		−0.91	−0.76		−1.43	−2.75		−5.90**	4.46		−8.21***	−6.28**
	(0.99)	(0.83)		(1.57)	(3.63)		(2.47)	(2.65)		(2.73)	(4.34)		(2.57)	(2.49)
g^r			−56.88***	−49.36**	−51.52	−8.75***	−6.72	−3.47	−55.76***	11.59	−127.60**	−6.16***	6.68	3.49
			(11.99)	(22.06)	(52.20)	(2.13)	(4.51)	(4.71)	(10.59)	(32.80)	(58.27)	(2.14)	(4.43)	(4.70)
vol.		−23.46*			1.33			−18.48			−66.47***			−18.29
		(13.61)			(31.06)			(14.93)			(23.38)			(14.91)
R^2	0.20	0.24	0.25	0.25	0.25	0.22	0.22	0.24	0.12	0.20	0.29	0.08	0.22	0.24

(g) West, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−7.59***	−7.78***		−7.52	−6.91		3.81	4.72		−5.74**	−3.72		−16.17***	−20.18***
	(2.27)	(2.98)		(6.07)	(7.09)		(6.15)	(6.24)		(2.68)	(4.53)		(5.43)	(6.51)
g^r			−54.81***	−0.64	−8.93	−13.61***	−19.14*	−23.24**	−85.00***	−32.32	−50.81	−8.80	21.22**	26.59**
			(14.67)	(39.47)	(64.38)	(3.85)	(10.37)	(11.42)	(28.87)	(32.81)	(39.78)	(6.31)	(10.48)	(11.67)
vol.		4.45			9.01			37.12			−23.15			44.51
		(28.00)			(46.06)			(26.13)			(33.79)			(27.22)
R^2	0.17	0.16	0.14	0.16	0.16	0.22	0.22	0.23	0.13	0.17	0.17	0.04	0.23	0.25

(h) West, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−3.19	−5.26**		−5.87**	−10.19***		−4.91*	3.88**		−3.41*	−11.34***		−3.09*	−16.75***
	(2.07)	(2.15)		(2.26)	(3.04)		(2.61)	(1.89)		(1.77)	(3.38)		(1.86)	(3.12)
g^r			0.04	3.85**	38.56**	−1.53	1.80	−19.87***	−7.84	−9.76*	50.68***	−2.17	−1.85	20.65***
			(0.53)	(1.72)	(15.00)	(1.48)	(1.34)	(4.56)	(6.33)	(5.45)	(18.30)	(1.75)	(1.35)	(4.78)
vol.		3.18**			−30.53**			18.38***			14.29***			19.19***
		(1.51)			(12.49)			(3.48)			(4.52)			(3.67)
R^2	0.11	0.19	−0.01	0.20	0.24	0.03	0.12	0.40	0.02	0.14	0.26	0.02	0.12	0.40

See table note on the page with results for South.

Table B.11: Tests Results of the Peak Rules applied to Unemployment: North Contral

(i) North Central, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−4.20**	−5.15***		−5.56***	−9.25***		−4.83***	2.94**		−4.22***	−8.88***		−4.08**	−14.82***
	(1.70)	(1.59)		(1.61)	(1.66)		(1.54)	(1.31)		(1.55)	(2.12)		(1.71)	(1.51)
g^r			−0.04	2.48***	36.91***	−2.01	0.75	−17.42***	−4.65**	−4.99	34.73***	−1.53**	−0.72	17.73***
			(0.51)	(0.84)	(9.19)	(1.79)	(1.08)	(2.40)	(2.35)	(3.35)	(11.39)	(0.71)	(1.10)	(2.39)
vol.		1.91**			−30.60***			15.44***			9.78***			15.71***
		(0.75)			(7.88)			(1.81)			(2.49)			(1.81)
R^2	0.13	0.16	0.00	0.17	0.24	0.04	0.13	0.31	0.01	0.14	0.21	0.01	0.13	0.32

(j) North Central, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−7.37***	−6.04***		−1.96	−0.34		−3.20	−5.45*		−10.30***	−7.93***		−10.27***	−7.08***
	(1.10)	(0.91)		(1.20)	(1.87)		(2.32)	(2.81)		(1.34)	(2.66)		(1.57)	(2.14)
g^r			−69.69***	−55.74***	−81.15***	−10.86***	−6.73*	−1.13	−47.34***	54.78***	26.47	−8.77***	7.35**	2.12
			(7.96)	(10.13)	(22.84)	(1.24)	(3.55)	(4.66)	(14.90)	(16.57)	(31.06)	(3.32)	(3.33)	(4.41)
vol.		−23.35***			14.93			−21.50***			−15.00			−19.81**
		(6.51)			(13.57)			(7.95)			(12.18)			(7.66)
R^2	0.44	0.51	0.54	0.55	0.55	0.46	0.48	0.51	0.09	0.50	0.51	0.15	0.48	0.51

(k) North Central, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−3.74	−0.74		−3.52	−5.70		12.74*	10.66		−4.54	10.06		−16.63***	−13.17***
	(2.46)	(2.16)		(3.71)	(3.92)		(7.05)	(7.37)		(5.26)	(7.16)		(5.00)	(4.88)
g^r			−29.75	−2.54	66.38	−10.38***	−28.85**	−22.59*	−28.83*	12.82	−133.78*	2.40	30.65***	25.44**
			(30.81)	(50.32)	(59.76)	(3.63)	(11.18)	(11.81)	(15.18)	(47.55)	(69.20)	(5.51)	(11.25)	(11.74)
vol.		−81.82***			−108.17***			−40.94			−148.80***			−34.86
		(26.80)			(36.53)			(25.16)			(48.65)			(22.99)
R^2	0.02	0.10	0.02	0.02	0.12	0.08	0.14	0.15	0.01	0.02	0.15	0.00	0.16	0.17

(l) North Central, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−2.72	−4.25**		−4.76**	−9.06***		−4.26*	3.36**		−2.94*	−8.07**		−2.63	−15.96***
	(1.98)	(2.00)		(2.09)	(3.01)		(2.16)	(1.55)		(1.75)	(3.33)		(1.79)	(2.34)
g^r			0.56	2.69**	32.13**	−0.54	1.61*	−19.18***	−5.69*	−6.77**	28.85*	−1.76*	−1.62*	19.13***
			(0.52)	(1.10)	(13.72)	(1.18)	(0.91)	(3.54)	(3.29)	(3.31)	(15.33)	(0.96)	(0.91)	(3.47)
vol.		2.18**			−25.78**			17.40***			8.92**			17.38***
		(0.93)			(11.69)			(2.64)			(3.80)			(2.58)
R^2	0.07	0.14	0.00	0.15	0.20	0.00	0.09	0.32	0.02	0.10	0.18	0.03	0.09	0.32

See table note on the page with results for South.

Table B.11: Tests Results of the Peak Rules applied to Unemployment: North East

(m) North East, Full period – January 1978 to September 2021 ($T = 525$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−4.64**	−6.28***		−7.13***	−12.44***		−6.91***	−2.87		−4.59**	−10.02***		−4.41**	−15.14***
	(1.99)	(1.92)		(2.09)	(2.36)		(2.24)	(2.93)		(1.87)	(2.35)		(1.86)	(2.46)
g^r			−1.01	4.24**	44.34***	−2.17	2.96*	−10.33	−6.01	−4.62	30.33**	−3.07*	−1.64	16.26***
			(0.68)	(1.76)	(10.85)	(1.54)	(1.51)	(7.20)	(3.88)	(5.20)	(12.67)	(1.80)	(1.36)	(3.65)
vol.		3.18**			−35.60***			11.93*			9.83***			15.99***
		(1.49)			(9.27)			(6.22)			(3.06)			(3.18)
R^2	0.13	0.16	0.00	0.18	0.24	0.03	0.15	0.18	0.01	0.13	0.21	0.02	0.13	0.24

(n) North East, First subperiod – January 1978 to June 1992 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−10.30***	−11.54***		−6.74***	−11.54***		−9.95***	−17.82***		−13.96***	−9.85***		−13.52***	−9.45***
	(1.90)	(1.57)		(1.86)	(2.65)		(3.34)	(3.63)		(2.00)	(2.27)		(2.83)	(2.42)
g^r			−70.71***	−44.74**	0.01	−20.99***	−1.15	19.28**	−17.09	40.21***	−22.37	−13.72***	6.68	−4.53
			(14.37)	(17.25)	(26.30)	(5.33)	(8.38)	(8.09)	(13.77)	(14.27)	(28.37)	(3.52)	(4.52)	(3.64)
vol.		−47.32***			−47.33***			−62.85***			−60.60***			−50.92***
		(7.84)			(14.89)			(9.62)			(19.80)			(7.60)
R^2	0.34	0.51	0.33	0.43	0.51	0.21	0.33	0.56	0.02	0.41	0.52	0.19	0.35	0.51

(o) North East, Second subperiod – July 1992 to December 2006 ($T = 174$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−5.74*	−6.97**		−5.64*	−8.00*		−0.81	0.45		−3.04	−3.94		−11.41***	−11.29***
	(3.46)	(3.40)		(3.38)	(4.41)		(3.91)	(6.26)		(4.04)	(3.54)		(3.81)	(3.70)
g^r			−8.99	−8.10	9.81	−17.09**	−15.86	−18.49	−28.42***	−22.25*	−33.47***	−0.83	12.81***	11.71***
			(9.00)	(8.94)	(23.70)	(7.94)	(9.72)	(16.13)	(9.03)	(12.69)	(11.40)	(4.61)	(4.75)	(4.06)
vol.		−13.80			−24.08			5.00			−25.63**			−4.19
		(13.15)			(31.59)			(21.27)			(12.63)			(12.40)
R^2	0.06	0.07	0.01	0.06	0.07	0.10	0.10	0.10	0.08	0.09	0.14	−0.01	0.10	0.10

(p) North East, Third subperiod – January 2007 to September 2021 ($T = 177$)

rule	ra		sp			mp			sb			mb		
g^{ra}	−3.05*	−5.22**		−6.02**	−13.06***		−5.49**	2.35		−3.11*	−11.61***		−2.93*	−20.30***
	(1.82)	(2.21)		(2.51)	(4.98)		(2.47)	(2.07)		(1.63)	(3.89)		(1.64)	(2.63)
g^r			−0.31	4.07*	49.92**	−1.13	2.76*	−23.48***	−5.90	−6.67	46.18**	−2.35	−1.96	25.16***
			(0.68)	(2.09)	(24.44)	(1.12)	(1.59)	(5.45)	(5.12)	(4.94)	(19.99)	(1.60)	(1.35)	(4.04)
vol.		3.29*			−40.23*			23.29***			13.59***			23.87***
		(1.75)			(20.88)			(4.22)			(4.93)			(3.09)
R^2	0.09	0.15	0.00	0.17	0.23	0.01	0.12	0.26	0.01	0.10	0.25	0.02	0.10	0.36

See table note on the page with results for South.

Table B.12: Tests Results of the Best Performing Peak Rules applied to Financial Variables over an Horizon of 9 months

variable	period	ra	R^2	rule	r	R^2	ra	r	R^2	ra	r	vol.	R^2
S&P500	1	0.09	0.00	mt	0.11	0.00	0.10	−0.01	0.00	0.02	0.29	0.40	−0.01
		(0.17)			(0.37)		(0.30)	(0.59)		(0.31)	(0.80)	(0.86)	
	2	0.36***	0.17	mp	0.76***	0.24	0.13	0.61**	0.25	0.64***	−0.27	1.24***	0.36
		(0.10)			(0.18)		(0.15)	(0.26)		(0.18)	(0.32)	(0.41)	
	3	0.52**	0.12	mt	0.98***	0.26	−0.36	1.37***	0.27	−0.51	1.77**	0.60	0.27
		(0.22)			(0.14)		(0.45)	(0.49)		(0.44)	(0.68)	(1.13)	
BAMLCC	1	0.36	0.04	st	3.13***	0.24	0.02	3.10***	0.23	0.19	1.30	−0.99	0.24
		(0.38)			(0.88)		(0.31)	(1.01)		(0.39)	(2.30)	(0.97)	
	2	−0.56	0.05	mp	−0.87	0.07	0.92	−1.96*	0.08	1.06	−2.14*	0.42	0.08
		(0.44)			(0.53)		(0.83)	(1.08)		(0.82)	(1.10)	(1.80)	
	3	−0.33	0.00	sp	−12.37***	0.23	0.82	−14.95***	0.25	0.05	−8.58	−2.33	0.26
		(1.06)			(3.49)		(0.64)	(2.85)		(0.81)	(5.89)	(2.21)	
UST3M	1	−0.21	0.00	sp	−11.60***	0.40	0.78	−12.12***	0.41	0.12	−7.00	−2.45	0.42
		(1.29)			(2.21)		(0.91)	(2.12)		(0.88)	(5.97)	(2.45)	
	2	2.03	0.04	sp	20.20	0.06	0.83	16.05	0.05	3.89	−5.70	14.69	0.06
		(1.34)			(12.32)		(2.04)	(18.07)		(4.61)	(33.33)	(15.27)	
	3	10.92**	0.16	mt	9.00*	0.09	32.92***	−24.69*	0.22	32.41***	−22.67	3.36	0.22
		(4.54)			(4.60)		(12.04)	(14.30)		(11.74)	(14.55)	(18.80)	
UST10Y	1	−1.78	0.03	sp	−16.54***	0.18	−0.09	−16.37***	0.18	−1.79	−1.01	−8.60	0.20
		(1.96)			(5.25)		(1.72)	(5.91)		(2.08)	(12.72)	(6.00)	
	2	1.71	0.01	mt	4.32	0.02	−1.04	6.20	0.02	−0.68	5.46	−1.58	0.01
		(2.39)			(4.04)		(3.89)	(5.71)		(3.95)	(6.18)	(11.76)	
	3	5.17	0.02	st	44.63***	0.24	−9.03	60.89***	0.28	6.00	−49.48*	−98.46***	0.41
		(5.58)			(9.13)		(5.48)	(9.13)		(5.21)	(26.45)	(25.32)	
HPIQ	1	−0.25	0.00	sp	−4.76***	0.13	2.97***	−10.41***	0.27	1.32	−5.42	−3.79*	0.29
		(0.88)			(1.69)		(0.82)	(2.34)		(0.91)	(3.55)	(2.26)	
	2	0.31	0.00	mt	2.41	0.01	−3.95*	14.38*	0.06	0.40	1.96	−7.19	0.07
		(0.70)			(2.56)		(2.37)	(8.39)		(5.32)	(14.95)	(8.80)	
	3	4.36***	0.60	st	12.05***	0.72	−1.10	14.66***	0.72	0.19	10.36***	−3.70**	0.73
		(0.84)			(1.21)		(1.15)	(2.73)		(0.96)	(2.47)	(1.78)	

This table shows the results of the peak rules that perform best in regressions of $PAGO_t$ on changes of financial variables over past the 9 months for three subperiods. See Table 2 for more information.

Table B.13: Tests Results of the Best Performing Peak Rules applied to Financial Variables over an Horizon of 15 months

variable	period	ra	R^2	rule	r	R^2	ra	r	R^2	ra	r	vol.	R^2
S&P500	1	0.17	0.03	mp	0.31	0.04	0.04	0.26	0.03	0.12	0.14	0.20	0.03
		(0.15)			(0.24)		(0.28)	(0.46)		(0.32)	(0.51)	(0.70)	
	2	0.32***	0.28	mp	0.64***	0.35	0.11	0.49**	0.36	0.47***	−0.11	0.97***	0.47
		(0.07)			(0.13)		(0.10)	(0.20)		(0.16)	(0.30)	(0.32)	
	3	0.54***	0.21	mt	0.89***	0.38	−0.15	1.04***	0.38	−0.23	1.25**	0.37	0.38
		(0.14)			(0.10)		(0.31)	(0.32)		(0.33)	(0.61)	(1.17)	
BAMLCC	1	0.40	0.11	st	3.20***	0.27	0.20	2.82***	0.29	0.28	1.22	−0.78	0.29
		(0.25)			(0.93)		(0.19)	(1.03)		(0.19)	(1.94)	(0.81)	
	2	−0.65*	0.11	mp	−0.80**	0.13	0.26	−1.09	0.12	0.48	−1.36	0.59	0.12
		(0.35)			(0.39)		(0.92)	(1.08)		(0.90)	(1.04)	(1.96)	
	3	−0.33	0.00	sp	−14.67***	0.27	0.52	−16.43***	0.29	−0.04	−7.88	−2.45	0.31
		(0.95)			(3.43)		(0.54)	(3.28)		(0.53)	(6.48)	(1.64)	
UST3M	1	−0.47	0.00	sp	−11.35***	0.45	0.37	−11.65***	0.45	0.60	−14.94**	1.36	0.45
		(1.09)			(2.14)		(0.71)	(1.94)		(0.69)	(6.32)	(2.39)	
	2	1.79*	0.07	mt	3.35***	0.10	−0.59	4.18	0.10	−2.48	11.07*	24.54**	0.20
		(0.97)			(1.22)		(2.40)	(3.45)		(2.61)	(5.72)	(11.88)	
	3	9.69***	0.30	mt	8.68***	0.19	24.40***	−17.54**	0.37	21.41***	−4.31	25.74	0.40
		(2.49)			(3.03)		(6.00)	(7.58)		(5.81)	(9.19)	(17.30)	
UST10Y	1	−1.98	0.09	sp	−16.14***	0.20	−0.85	−14.13**	0.21	−1.52	−4.31	−5.10	0.22
		(1.32)			(5.31)		(1.21)	(6.15)		(1.11)	(12.51)	(5.77)	
	2	2.73	0.06	mt	4.42	0.04	2.98	−0.59	0.05	3.93	−2.39	−6.61	0.06
		(2.08)			(3.32)		(3.30)	(4.33)		(3.41)	(5.17)	(12.44)	
	3	7.33	0.07	st	50.48***	0.37	−2.81	55.23***	0.38	5.75*	−61.02***	−116.33***	0.60
		(5.36)			(7.67)		(4.94)	(8.64)		(3.46)	(22.81)	(22.94)	
HPIQ	1	−0.31	0.00	sp	−4.90**	0.16	1.35**	−8.61***	0.24	0.47	−4.39	−2.90	0.25
		(0.60)			(2.08)		(0.66)	(3.08)		(1.21)	(6.29)	(3.41)	
	2	−0.01	−0.01	sp	−1.63	0.01	3.23*	−12.81**	0.12	2.15	−7.29	−5.02	0.13
		(0.45)			(1.74)		(1.70)	(6.32)		(1.33)	(5.90)	(5.30)	
	3	3.17***	0.72	st	12.02***	0.77	0.62	9.85***	0.77	1.79**	3.37	−4.99**	0.78
		(0.42)			(1.09)		(0.95)	(3.35)		(0.73)	(3.34)	(2.19)	

This table shows the results of the peak rules that perform best in regressions of $PAGO_t$ on changes of financial variables over last the 15 months for three subperiods. See Table 2 for more information.

Table B.14: Tests Results of the Best Performing Peak Rules applied to Macroeconomic Variables over an Horizon of 9 Months

variable	period	ra	R^2	rule	r	R^2	ra	r	R^2	ra	r	vol.	R^2
CPI	1	-4.03^{***}	0.50	sp	-31.25^{***}	0.57	-1.25	-23.36^{**}	0.58	-3.35^{*}	-3.77	-12.31	0.59
		(0.50)			(4.55)		(1.35)	(11.13)		(1.85)	(16.29)	(8.30)	
	2	-2.40	0.01	st	11.90	0.03	-2.92	13.19	0.05	-7.38^{*}	43.60^{**}	20.63^{*}	0.10
		(3.41)			(7.53)		(3.05)	(8.29)		(3.84)	(18.74)	(11.26)	
	3	0.52	0.00	sp	-59.39^{***}	0.25	4.42^{*}	-69.80^{***}	0.30	3.43	-62.44	-3.37	0.30
		(3.55)			(13.75)		(2.41)	(13.86)		(7.84)	(51.29)	(21.96)	
GNP	1	-0.72	0.01	sp	-1.40	0.01	-0.39	-0.77	0.00	-0.77	0.70	-1.66	0.00
		(1.07)			(1.70)		(2.31)	(4.02)		(2.12)	(3.69)	(3.03)	
	2	2.76^{***}	0.16	mp	2.86^{***}	0.16	7.46	-4.94	0.16	9.77	-7.53	0.80	0.16
		(0.63)			(0.68)		(8.11)	(8.75)		(7.02)	(7.58)	(1.62)	
	3	1.43	0.03	mp	3.12^{*}	0.08	0.36	2.89^{**}	0.08	-4.29	9.92	-4.44	0.09
		(1.44)			(1.65)		(0.91)	(1.33)		(5.00)	(8.20)	(4.97)	
NFP	1	3.69^{***}	0.19	mp	4.94^{***}	0.15	6.23^{**}	-3.91	0.19	5.30	-2.42	-6.49	0.20
		(1.05)			(1.67)		(2.97)	(4.77)		(3.42)	(5.50)	(11.42)	
	2	5.79^{***}	0.29	mp	7.33^{***}	0.28	6.52	-0.96	0.29	1.05	6.93	-16.18^{**}	0.35
		(1.54)			(2.25)		(5.19)	(7.54)		(5.91)	(9.26)	(6.38)	
	3	2.45	0.09	mp	4.59	0.10	2.80^{*}	5.17^{**}	0.22	10.23^{***}	-6.98	8.81^{**}	0.27
		(1.98)			(2.85)		(1.54)	(2.40)		(3.43)	(7.38)	(4.44)	
UNEMP	1	-8.72^{***}	0.35	mp	-13.02^{***}	0.32	-6.46^{*}	-4.00	0.35	-9.91^{**}	4.92	-16.70^{*}	0.38
		(1.14)			(1.90)		(3.29)	(5.44)		(4.31)	(8.82)	(10.00)	
	2	-6.55^{***}	0.08	sp	-48.39^{***}	0.20	0.68	-50.71^{**}	0.19	2.52	-73.10^{***}	16.46	0.20
		(2.41)			(16.25)		(3.43)	(20.61)		(3.83)	(25.81)	(13.31)	
	3	-2.77	0.06	st	-6.53	0.02	-2.89	-7.38	0.08	-12.21^{**}	45.26^{**}	14.15^{**}	0.20
		(2.30)			(4.85)		(2.04)	(4.81)		(4.89)	(20.92)	(5.81)	
PCE	1	0.77	0.00	sp	4.06^{*}	0.05	-0.41	4.74	0.04	-0.29	3.90	0.84	0.04
		(1.58)			(2.16)		(2.27)	(4.62)		(2.41)	(6.06)	(3.40)	
	2	3.58^{***}	0.15	mp	3.48^{***}	0.12	6.23^{***}	-2.89	0.15	-0.64	5.12	-5.83	0.19
		(1.11)			(1.22)		(2.27)	(2.54)		(3.99)	(4.68)	(3.60)	
	3	1.41	0.04	mp	1.10^{*}	0.03	1.28	0.95^{*}	0.06	-0.55	3.90	-2.79	0.06
		(1.09)			(0.62)		(0.94)	(0.51)		(3.80)	(5.82)	(5.72)	

This table shows the results of the peak rules that perform best in regressions of $PAGO_t$ on changes of macro variables over the past 9 months for three subperiods. See Table 3 for more information.

Table B.15: Tests Results of the Best Performing Peak Rules applied to Macroeconomic Variables over an Horizon of 15 Months

variable	period	ra	R^2	rule	r	R^2	ra	r	R^2	ra	r	vol.	R^2
CPI	1	-2.77^{***}	0.60	sp	-32.49^{***}	0.66	-1.02^{*}	-22.55^{***}	0.68	-1.65^{**}	−12.76	−5.99	0.68
		(0.26)			(3.22)		(0.53)	(6.48)		(0.82)	(10.78)	(5.51)	
	2	−2.57	0.03	mt	14.38^{*}	0.08	−2.90	15.20^{*}	0.12	-9.55^{***}	59.30^{***}	33.40^{**}	0.27
		(3.02)			(7.65)		(2.49)	(8.96)		(3.55)	(20.90)	(13.49)	
	3	−0.95	0.00	sp	-72.96^{***}	0.40	1.48	-75.31^{***}	0.40	−0.32	−53.36	−8.62	0.41
		(3.64)			(13.02)		(2.12)	(13.77)		(3.82)	(34.93)	(11.88)	
GNP	1	−1.01	0.05	sp	−2.50	0.04	−0.78	−0.87	0.05	−1.08	1.36	−2.52	0.06
		(0.88)			(1.81)		(1.46)	(3.47)		(1.48)	(4.43)	(3.52)	
	2	2.28^{***}	0.22	mp	2.33^{***}	0.22	5.71	−3.56	0.22	7.35^{*}	−5.39	0.98	0.22
		(0.35)			(0.37)		(4.43)	(4.78)		(3.76)	(4.09)	(1.69)	
	3	1.85	0.05	mp	4.17^{**}	0.15	0.83	3.74^{***}	0.15	−0.45	5.41	−1.19	0.15
		(1.69)			(1.74)		(1.03)	(1.38)		(5.03)	(7.21)	(4.76)	
NFP	1	2.04^{**}	0.13	mp	2.84^{**}	0.12	2.60	−0.85	0.13	2.60	−0.85	0.02	0.12
		(0.80)			(1.27)		(3.30)	(5.16)		(3.80)	(5.85)	(11.56)	
	2	4.19^{***}	0.38	mp	5.32^{***}	0.38	3.91	0.36	0.38	1.01	4.38	-12.15^{**}	0.42
		(0.98)			(1.37)		(4.08)	(5.91)		(4.92)	(7.23)	(6.00)	
	3	2.36	0.12	mp	4.20^{*}	0.15	2.80^{***}	4.85^{***}	0.32	6.14^{**}	−0.91	4.18	0.34
		(1.60)			(2.19)		(1.05)	(1.59)		(2.53)	(5.78)	(3.49)	
UNEMP	1	-6.31^{***}	0.38	mp	-9.79^{***}	0.34	-4.90^{**}	−2.67	0.39	-8.50^{***}	7.11	-25.95^{***}	0.47
		(1.02)			(2.16)		(2.29)	(4.38)		(2.60)	(5.80)	(7.80)	
	2	-6.34^{***}	0.16	sp	-60.22^{***}	0.31	−0.50	-57.75^{***}	0.30	0.07	-69.62^{**}	9.12	0.31
		(1.91)			(14.92)		(2.49)	(18.09)		(2.86)	(27.17)	(14.57)	
	3	−3.25	0.10	mt	−1.86	0.02	-3.55^{*}	-2.42^{**}	0.14	-13.43^{***}	15.99^{***}	15.48^{***}	0.37
		(2.30)			(1.20)		(2.07)	(1.20)		(2.32)	(3.28)	(2.56)	
PCE	1	1.21	0.05	sp	7.08^{***}	0.17	−0.09	7.25	0.16	0.02	5.71	1.93	0.17
		(1.30)			(2.32)		(1.76)	(4.82)		(1.76)	(5.26)	(2.52)	
	2	2.98^{***}	0.19	mt	9.26^{***}	0.18	2.08^{**}	6.14^{*}	0.25	2.50^{**}	2.56	−3.72	0.26
		(0.65)			(2.72)		(0.87)	(3.28)		(1.06)	(6.68)	(6.31)	
	3	1.64	0.06	mp	0.99^{**}	0.04	1.49	0.85^{*}	0.09	0.37	2.41	−1.57	0.09
		(1.22)			(0.48)		(1.12)	(0.47)		(3.04)	(3.73)	(4.01)	

This table shows the results of the peak rules that perform best in regressions of $PAGO_t$ on changes of macro variables over the past 15 months for three subperiods. See Table 3 for more information.

Table B.16: Test Results of the End Rule for Financial Variables Considering January Respondents Only

(a) S&P500

	Jan. 1978 – Jan. 1992			Jan. 1993 – Jan. 2006			Jan. 2007 – Jan. 2021		
g^{ra}	0.01		−0.02	0.28***		0.08	0.46***		0.65***
	(0.10)		(0.13)	(0.06)		(0.05)	(0.08)		(0.15)
g^{end}		0.55	0.56		1.95***	1.66***		−1.71**	−2.89***
		(1.28)	(1.37)		(0.31)	(0.45)		(0.59)	(0.33)
R^2	−0.08	−0.05	−0.14	0.24	0.45	0.42	0.10	0.01	0.27

(b) BAMLCC

	Jan. 1978 – Jan. 1992			Jan. 1993 – Jan. 2006			Jan. 2007 – Jan. 2021		
g^{ra}	0.24		−0.06	−0.57***		−0.34***	0.02		−0.26
	(0.22)		(0.16)	(0.19)		(0.07)	(0.42)		(0.57)
g^{end}		4.04***	4.16***		−4.17**	−2.75*		−6.91	−7.27
		(0.81)	(0.97)		(1.41)	(1.35)		(4.15)	(5.14)
R^2	−0.05	0.17	0.10	0.09	0.10	0.06	−0.08	0.05	−0.02

(c) UST3M

	Jan. 1978 – Jan. 1992			Jan. 1993 – Jan. 2006			Jan. 2007 – Jan. 2021		
g^{ra}	0.33		0.29	2.70***		3.14***	8.74***		10.15***
	(1.35)		(1.49)	(0.58)		(0.73)	(1.57)		(1.84)
g^{end}		−1.98	−1.85		2.57	−6.57		11.88	−42.14***
		(3.60)	(3.76)		(3.78)	(4.47)		(18.26)	(10.26)
R^2	−0.07	−0.07	−0.16	0.15	−0.08	0.10	0.15	−0.07	0.10

(d) UST10Y

	Jan. 1978 – Jan. 1992			Jan. 1993 – Jan. 2006			Jan. 2007 – Jan. 2021		
g^{ra}	−1.14		−0.70	1.94**		0.71	2.48		5.53
	(1.24)		(1.31)	(0.76)		(0.69)	(3.09)		(3.66)
g^{end}		−11.18**	−10.17		18.94**	16.12*		−32.96*	−40.94**
		(4.76)	(6.05)		(6.79)	(7.67)		(16.69)	(15.18)
R^2	−0.05	−0.01	−0.09	0.00	0.06	−0.02	−0.07	0.01	−0.02

(e) HPIQ

	Jan. 1978 – Jan. 1992			Jan. 1993 – Jan. 2006			Jan. 2007 – Jan. 2021		
g^{ra}	−0.07		−2.81*	0.45		−1.85**	3.71***		4.16***
	(0.33)		(1.50)	(0.30)		(0.61)	(0.17)		(0.32)
g^{end}		1.83	9.24**		5.18***	11.65***		9.28***	−2.17
		(1.15)	(3.70)		(0.63)	(1.95)		(1.21)	(1.34)
R^2	−0.08	−0.05	0.00	−0.06	0.09	0.13	0.69	0.28	0.67

This table shows the results of the end rule in regressions of $PAGO_t$ in January on changes of financial variables over the past year using three different sample periods. The row g^{ra} contains the coefficient estimates for the rational rule of Equation (3). The row g^{end} contains the coefficient estimates for the end rules in Equation (5). For each financial variable and each sample period, we report the single regression with the rational rule, the single regression with the end rule and the multiple regression with both rules. We report standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. Superscripts ***,**,* indicate significance at the 1%, 5% and 10% level. The row "R^2" gives the adjusted R^2. The sample period is from January 1978 to June 1992 for the first sample ($T = 15$), July 1992 to December 2006 for the second sample ($T = 14$) and January 2007 to September 2021 for the third sample ($T = 15$).

C Additional results for the herding analysis

[Table C.1 about here.]

[Table C.1 (continued)about here.]

[Table C.2 about here.]

[Table C.2 (continued)about here.]

[Table C.3 about here.]

[Table C.4 about here.]

[Table C.4 (continued)about here.]

[Table C.5 about here.]

Table C.1: Tests of the Herding Effect with Non-Categorical Control Variables

(a) Effect via PEXP

	Age	Egrade	Homeamt	Homeown	Income	Invamt	Invest	Numadt	Numkid	Sex
intercept	−8.51	−2.73	−1.19	−2.65	−6.18	−2.77	−5.22	−2.03	−5.08	−2.55
	(6.96)	(7.78)	(8.89)	(7.50)	(7.54)	(7.35)	(7.27)	(7.14)	(7.38)	(7.54)
$PAGO^{\text{prelim}}$	0.87***	0.80***	0.84***	0.84***	0.82***	0.81***	0.79***	0.82***	0.84***	0.82***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
$PEXP^{\text{prelim}}$	0.19**	0.23***	0.18*	0.19**	0.23***	0.22***	0.25***	0.20**	0.20**	0.21**
	(0.09)	(0.09)	(0.10)	(0.09)	(0.09)	(0.08)	(0.08)	(0.09)	(0.09)	(0.09)
Control	−0.69***	4.89**	0.01	−13.92	0.25***	0.01**	0.13	−1.92	7.11	0.10
	(0.22)	(2.19)	(0.02)	(12.46)	(0.09)	(0.01)	(0.11)	(8.06)	(4.38)	(0.11)

(b) Effect via BUS1Y

	Age	Egrade	Homeamt	Homeown	Income	Invamt	Invest	Numadt	Numkid	Sex
intercept	8.26*	16.65***	13.23***	13.21***	13.07***	15.80***	15.65***	15.23***	11.80***	14.98***
	(4.77)	(4.32)	(4.54)	(5.05)	(4.19)	(4.68)	(4.81)	(4.55)	(4.39)	(4.68)
$PAGO^{\text{prelim}}$	0.84***	0.77***	0.73***	0.80***	0.79***	0.78***	0.77***	0.78***	0.80***	0.78***
	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)
$BUS1Y^{\text{prelim}}$	0.10**	0.13***	0.19***	0.11**	0.12**	0.12**	0.13***	0.12**	0.12**	0.12**
	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Control	−0.62***	4.48**	0.01	−13.02	0.23***	0.01*	0.09	−2.36	6.78	0.10
	(0.22)	(2.15)	(0.02)	(11.73)	(0.08)	(0.01)	(0.11)	(8.01)	(4.30)	(0.11)

This table shows the results of regressions of $PAGO_t^{\text{pa}}$ on a constant, $PAGO_t^{\text{prelim}}$, preliminary values of forward-looking variables and different control variables. The preliminary forward-looking variables *PEXP*, *BUS1Y*1*Y* and *BUS5Y* are considered separately in panels (a-c) and jointly in panel (d). The preliminary variables are published by the CAB during month t. $PAGO_t^{\text{pa}}$ is based on the interviews taken after the announcement of the preliminary values, and is available from January 2000 onward. Each column reports the estimation results for the inclusion of the control variable in the column heading into the regression. The control variables are constructed as the difference between the weighted averages of the prelim and post-announcement observations. See Table A.2 for an explanation of the control variables. We report parameter estimates with standard errors in parentheses based on Newey and West (1987) with a Bartlett kernel and bandwidth value of 12. Superscripts ***,**,* indicate significance at the 1, 5 and 10% level.

Table C.1: Tests of the Herding Effect with Non-Categorical Control Variables – *continued*

(c) Effect via BUS5Y

	Age	Egrade	Homeamt	Homeown	Income	Invamt	Invest	Numadt	Numkid	Sex
intercept	4.01	11.84***	8.38*	9.14*	8.44**	11.51**	10.73**	10.95**	7.49*	10.63**
	(4.56)	(4.32)	(4.84)	(4.76)	(4.12)	(4.57)	(4.56)	(4.23)	(4.45)	(4.60)
$PAGO^{\text{prelim}}$	0.91***	0.84***	0.85***	0.88***	0.86***	0.85***	0.84***	0.86***	0.88***	0.86***
	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)
$BUS5Y^{\text{prelim}}$	0.07	0.10**	0.10*	0.07	0.09*	0.08	0.10*	0.08*	0.08	0.08*
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Control	−0.69***	4.61**	0.01	−15.42	0.24***	0.01**	0.11	−2.47	7.23*	0.10
	(0.21)	(2.19)	(0.02)	(12.00)	(0.08)	(0.01)	(0.11)	(8.11)	(4.30)	(0.11)

(d) Effect via PEXP, BUS1Y and BUS5Y

	Age	Egrade	Homeamt	Homeown	Income	Invamt	Invest	Numadt	Numkid	Sex
intercept	−2.18	4.55	9.49	4.07	0.71	3.81	2.19	5.01	1.97	4.56
	(7.93)	(8.57)	(8.94)	(8.47)	(8.62)	(8.26)	(7.91)	(8.33)	(7.83)	(8.43)
$PAGO^{\text{prelim}}$	0.80***	0.72***	0.71***	0.76***	0.75***	0.73***	0.72***	0.74***	0.77***	0.74***
	(0.07)	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$PEXP^{\text{prelim}}$	0.20*	0.22**	0.13	0.19*	0.22**	0.22**	0.24**	0.20*	0.20*	0.20**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.09)	(0.10)	(0.10)	(0.10)
$BUS1Y^{\text{prelim}}$	0.14**	0.15**	0.24***	0.16**	0.15**	0.16**	0.16**	0.16**	0.16**	0.16**
	(0.07)	(0.07)	(0.05)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$BUS5Y^{\text{prelim}}$	−0.15	−0.13	−0.15***	−0.15*	−0.13	−0.15*	−0.14	−0.15	−0.15*	−0.15*
	(0.09)	(0.08)	(0.06)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Control	−0.62***	4.61**	0.01	−12.90	0.23***	0.01*	0.11	−1.58	6.66	0.11
	(0.01)	(0.03)	(0.65)	(0.29)	(0.01)	(0.07)	(0.35)	(0.84)	(0.13)	(0.32)

See Table note on the previous page.

Table C.2: Test of the Herding Effect with Categorical Control Variables

(a) Effect via PEXP

	Marital status				Region			
	Married	Divorced	Widowed	Never married	North Central	North East	South	West
intercept	−2.80	−2.53	−3.79	−2.98	−2.41	−2.08	−2.60	−2.68
	(7.42)	(7.50)	(7.40)	(7.76)	(7.63)	(7.14)	(7.73)	(7.72)
$PAGO^{\text{prelim}}$	0.82***	0.82***	0.83***	0.83***	0.83***	0.82***	0.82***	0.82***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
$PEXP^{\text{prelim}}$	0.21**	0.21**	0.20**	0.20**	0.20**	0.20**	0.21**	0.20**
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Control	0.05	−0.25	−0.13	0.20*	−0.14	0.20	−0.09	0.07
	(0.12)	(0.19)	(0.16)	(0.12)	(0.12)	(0.13)	(0.13)	(0.13)

(b) Effect via BUS1Y

	Marital status				Region			
	Married	Divorced	Widowed	Never married	North Central	North East	South	West
c	14.63***	14.77***	13.35***	13.68***	14.37***	14.78***	14.71***	14.34***
	(4.45)	(4.55)	(4.97)	(4.52)	(4.66)	(4.61)	(4.69)	(4.67)
$PAGO^{\text{prelim}}$	0.78***	0.79***	0.79***	0.79***	0.79***	0.79***	0.78***	0.78***
	(0.06)	(0.06)	(0.07)	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)
$BUS1Y^{\text{prelim}}$	0.12**	0.12**	0.12**	0.12**	0.12**	0.12**	0.12**	0.12***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Control	0.03	−0.22	−0.13	0.20*	−0.13	0.16	−0.10	0.11
	(0.12)	(0.18)	(0.16)	(0.11)	(0.12)	(0.13)	(0.13)	(0.12)

This table shows the results of regressions of $PAGO_t^{\text{pa}}$ on a constant, $PAGO_t^{\text{prelim}}$, preliminary values of forward-looking variables and different categorical control variables. See the note of Table C.1 for further explanations.

Table C.2: Test of the Herding Effect on $PAGO$ with Categorical Control Variables – *continued*

(c) Effect via BUSL

	Marital status				Region			
	Married	Divorced	Widowed	Never married	North Central	North East	South	West
intercept	10.33^{**}	10.68^{**}	9.08^{*}	9.52^{**}	10.39^{**}	10.71^{**}	10.31^{**}	10.23^{**}
	(4.42)	(4.51)	(4.70)	(4.46)	(4.55)	(4.26)	(4.62)	(4.48)
$PAGO^{\text{prelim}}$	0.86^{***}	0.86^{***}	0.87^{***}	0.87^{***}	0.87^{***}	0.86^{***}	0.86^{***}	0.86^{***}
	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$BUS5Y^{\text{prelim}}$	0.08	0.08	0.08	0.08	0.07	0.08	0.09^{*}	0.08
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Control	0.03	−0.23	−0.13	0.21^{*}	−0.13	0.20	−0.10	0.07
	(0.12)	(0.18)	(0.16)	(0.12)	(0.13)	(0.14)	(0.13)	(0.14)

(d) Effect via PEXP, BUS1Y and BUSL

	Marital status				Region			
	Married	Divorced	Widowed	Never married	North Central	North East	South	West
c	4.30	4.14	3.29	4.02	4.28	4.51	4.63	4.42
	(8.24)	(8.45)	(8.48)	(8.62)	(8.48)	(8.52)	(8.63)	(8.64)
$PAGO^{\text{prelim}}$	0.75^{***}	0.75^{***}	0.76^{***}	0.76^{***}	0.75^{***}	0.75^{***}	0.75^{***}	0.75^{***}
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$PEXP^{\text{prelim}}$	0.20^{*}	0.21^{**}	0.20^{*}	0.20^{*}	0.21^{*}	0.20^{*}	0.20^{*}	0.20^{*}
	(0.10)	(0.11)	(0.10)	(0.10)	(0.11)	(0.10)	(0.10)	(0.10)
$BUS1Y^{\text{prelim}}$	0.16^{**}	0.16^{**}	0.16^{**}	0.16^{**}	0.16^{**}	0.15^{**}	0.16^{**}	0.17^{**}
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$BUS5Y^{\text{prelim}}$	-0.15^{*}	-0.15^{*}	-0.15^{*}	-0.15^{*}	-0.17^{*}	−0.14	-0.14^{*}	-0.16^{*}
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Control	0.04	−0.24	−0.13	0.20^{*}	−0.16	0.15	−0.09	0.13
	(0.12)	(0.18)	(0.16)	(0.11)	(0.12)	(0.12)	(0.13)	(0.12)

See table note on previous page.

Table C.3: Estimates results for the VAR models for PAGO in combination of one or all of the forwards looking variables

	$PAGO_t^{\text{final}}$	$PEXP_t^{\text{final}}$	$PAGO_t^{\text{final}}$	$BUS1Y1Y_t^{\text{final}}$	$PAGO_t^{\text{final}}$	$BUS5Y_t^{\text{final}}$	$PAGO_t^{\text{final}}$	$PEXP_t^{\text{final}}$	$BUS1Y1Y_t^{\text{final}}$	$BUS5Y_t^{\text{final}}$
ψ	0.52	22.42***	7.35***	6.98*	4.58*	10.01***	6.07	27.06***	1.78	1.86
	(5.24)	(4.25)	(2.19)	(3.92)	(2.44)	(2.90)	(5.64)	(4.60)	(10.12)	(6.72)
$PAGO_{t-1}^{\text{final}}$	0.91***	0.08***	0.86***	0.07	0.91***	0.08**	0.85***	0.06*	0.05	0.01
	(0.03)	(0.03)	(0.03)	(0.06)	(0.03)	(0.04)	(0.04)	(0.03)	(0.07)	(0.04)
$PEXP_{t-1}^{\text{final}}$	0.07	0.75***					0.06	0.64***	0.07	0.19**
	(0.06)	(0.05)					(0.07)	(0.06)	(0.13)	(0.09)
$BUS1Y_{t-1}^{\text{final}}$			0.08***	0.85***			0.12***	−0.01	0.84***	0.10**
			(0.02)	(0.04)			(0.04)	(0.03)	(0.06)	(0.04)
$BUS5Y_{t-1}^{\text{final}}$					0.05	0.79***	−0.09	0.12**	−0.01	0.62***
					(0.04)	(0.04)	(0.06)	(0.05)	(0.11)	(0.07)
R^2	0.89	0.75	0.90	0.81	0.89	0.77	0.90	0.76	0.81	0.78

This table gives the estimation results of the VAR models of order 1 that are formed by PAGO and one or all of the three forward-looking variables PEX, BUS1Y and BUSL. For all variables we use the final-series. The coefficients in the row ψ correspond with the intercept terms. We report parameter estimates with standard errors in parentheses. The row "R^2" gives the adjusted R^2. Superscripts ***,**,* indicate significant difference from zero at the 1, 5 and 10% level. The sample period is from Jan-2000 to Sept-2021 ($T = 261$).

Table C.4: Estimation results for the predictive models for the forward-looking variables

(a) $PEXP^{\text{pa}}$ as dependent variable

	(1)	(2)	(3)	(4)
c	33.74***	27.49***	36.70***	28.83***
	(5.09)	(5.07)	(5.66)	(5.71)
$PEXP^{\text{prelim}}$	0.79***	0.76***	0.74***	0.74***
	(0.06)	(0.06)	(0.07)	(0.07)
$BUS1Y^{\text{prelim}}$			0.02	0.00
			(0.04)	(0.04)
$BUS5Y^{\text{prelim}}$			0.03	0.02
			(0.06)	(0.06)
$PAGO^{\text{prelim}}$	−0.02	0.04	−0.04	0.03
	(0.03)	(0.03)	(0.04)	(0.04)
Dif. Age		−0.81***		−0.80***
		(0.15)		(0.16)
Dif. End Grade		−0.96		−0.91
		(1.46)		(1.47)
Dif. Income		−0.05		−0.05
		(0.06)		(0.06)
R^2	0.60	0.63	0.60	0.63

(b) $BUS1Y^{\text{pa}}$ as dependent variable

	(1)	(2)	(3)	(4)
c	16.92***	14.30***	18.28*	16.71
	(4.22)	(5.40)	(10.27)	(10.86)
$PEXP^{\text{prelim}}$			0.08	0.07
			(0.14)	(0.14)
$BUS1Y^{\text{prelim}}$	0.94***	0.94***	1.03***	1.03***
	(0.05)	(0.05)	(0.07)	(0.07)
$BUS5Y^{\text{prelim}}$			−0.21*	−0.22**
			(0.11)	(0.11)
$PAGO^{\text{prelim}}$	−0.09	−0.06	−0.09	−0.06
	(0.06)	(0.07)	(0.07)	(0.08)
Dif. Age		−0.07		−0.07
		(0.30)		(0.30)
Dif. End Grade		−3.34		−3.90
		(2.79)		(2.80)
Dif. Income		0.06		0.05
		(0.11)		(0.11)
R^2	0.78	0.78	0.78	0.78

This table shows the results of regressions of the forward-looking post-announcement (pa) variables PEXP, BUS1Y and BUSL on a constant, their preliminary values, $PAGO_t^{\text{prelim}}$ and control variables. The preliminary variables are published by the CAB during month t. The pa-values are based on the interviews taken after the announcement of the preliminary values, and is available from January 2000 onwards. As control variables, we include the differences between the weighted averages of age, end grade and income between the post-announcement and preliminary sub samples. We report parameter estimates with standard errors in parentheses. The row "R^2" gives the adjusted R^2. Superscripts ***,** ,* indicate significance at the 1, 5 and 10% level. The sample period is from Jan-2000 to Sept-2021 ($T = 261$).

Table C.4: Estimation results for the predictive models for the forward-looking variables – *continued*

(c) $BUS5Y^{\text{pa}}$ as dependent variable

	(1)	(2)	(3)	(4)
c	1.39	−5.37	-17.61^{*}	-24.14^{**}
	(4.78)	(5.65)	(10.27)	(10.82)
$PEXP^{\text{prelim}}$			0.46^{***}	0.46^{***}
			(0.14)	(0.14)
$BUS1Y^{\text{prelim}}$			0.24^{***}	0.23^{***}
			(0.07)	(0.07)
$BUS5Y^{\text{prelim}}$	0.86^{***}	0.84^{***}	0.46^{***}	0.45^{***}
	(0.07)	(0.07)	(0.11)	(0.11)
$PAGO^{\text{prelim}}$	0.13^{**}	0.18^{***}	−0.08	−0.02
	(0.06)	(0.06)	(0.07)	(0.08)
Dif. Age		-0.62^{**}		-0.52^{*}
		(0.31)		(0.30)
Dif. End Grade		−1.65		−1.42
		(2.89)		(2.79)
Dif. Income		0.05		0.05
		(0.11)		(0.11)
R^2	0.61	0.61	0.64	0.64

See table note on previous page.

Table C.5: Estimates for predictive models for the prelim values of the ICS variables

(a) Parameters

	$PAGO_t^{\text{prelim}}$	$PEXP_t^{\text{prelim}}$	$BUS1Y_t^{\text{prelim}}$	$BUS5Y_t^{\text{prelim}}$
Intercept	0.69	19.26***	−6.12	−4.86
	(5.99)	(4.78)	(10.02)	(7.29)
$PAGO_{t-1}^{\text{final}}$	0.89***	0.08**	0.09	0.05
	(0.04)	(0.03)	(0.06)	(0.05)
$PEXP_{t-1}^{\text{final}}$	0.08	0.68***	0.06	0.20**
	(0.08)	(0.06)	(0.13)	(0.09)
$BUS1Y_{t-1}^{\text{final}}$	0.08**	−0.01	0.81***	0.04
	(0.04)	(0.03)	(0.06)	(0.05)
$BUS5Y_{t-1}^{\text{final}}$	−0.08	0.12**	0.06	0.68***
	(0.06)	(0.05)	(0.11)	(0.08)
R^2	0.89	0.77	0.82	0.76

(b) Covariances

$PAGO_t^{\text{prelim}}$	42.06	13.25	32.62	17.11
$PEXP_t^{\text{prelim}}$	13.25	26.77	25.60	17.92
$BUS1Y_t^{\text{prelim}}$	32.62	25.60	117.49	58.44
$BUS5Y_t^{\text{prelim}}$	17.11	17.92	58.44	62.29

This table shows the results of regressions of the prelim values of the ICS variables PAGO, PEXP, BUS1Y and BUSL on their final values in the previous period. We report parameter estimates with standard errors in parentheses. The row "R^2" gives the adjusted R^2. Superscripts ***,**,* indicate significance at the 1, 5 and 10% level. Below "Covariances" we report the variance-covariance matrix of the errors terms. The sample period is from Jan-2000 to Sept-2021 ($T = 261$).