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ABSTRACT

Recent theoretical advances in consumption theory suggest that there may exist predictable consumption surges which, if not taken sufficiently into account in forecasting, may lead to predictable forecast errors. We use this insight to identify economic variables that might help improve the OECD's forecasts for Germany's consumption and GDP growth.

JEL-Classification: C53; E21; E37..
Keywords: Consumption, GDP, macroeconomic forecasts, non-linear dynamics.

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1   Introduction

In this paper, we employ recent advances in the theory of consumption to identify economic variables that might help improve the *Organization of Economic Cooperation and Development* (OECD)—and hopefully other—forecasts for Germany. Specifically, several studies have documented that consumption growth in the major industrial countries, far from being unpredictable as the *Permanent Income Hypothesis*—the prevailing consumption paradigm—postulates, is correlated with both contemporaneous (see, among others, Campbell and Mankiw, 1990, 1991) and expected future income growth (see Antzoulatos, 1994b, 1997). Moreover, it exhibits non-linear dynamics characterized by occasional surges during which consumption grows faster than justified by contemporaneous income growth (Antzoulatos, 1994b; Caballero, 1995).

For the purpose of improving macroeconomic forecasts, if these surges are not taken sufficiently into account, there may be periods of predictable consumption underprediction—essentially predictable forecast errors. Indeed, Antzoulatos (1996) documents such errors for the OECD's forecasts for the USA. Moreover, he shows that these errors are associated with periods of rising consumer installment credit and, taking into account the forward-looking nature of consumption, argues that these results are not likely to be coincidental and, hence, may help improve the forecasts under scrutiny. Briefly, rising debt may reflect optimist income expectations which, it turn, induce people to spend more out of their contemporaneous income, setting the stage for a consumption surge.

In the same spirit, we also find strong evidence of predictable errors in the OECD's consumption-growth forecasts for Germany. These errors, consistent with the forward-looking nature of consumption, are associated with periods of a falling personal savings ratio. This ratio is used instead of some measure of consumer credit, as in Antzoulatos (1996), because Germany's consumer credit series in *Datastream* exhibit several discontinuities. The logical link between the two surge-indicators is that rising consumer debt is associated with falling savings ratio. Moreover, we find strong evidence about predictable GDP-growth forecast errors. Specifically, as with consumption, the OECD forecasts tend to underpredict GDP growth during periods of a falling savings ratio. Seemingly, the consumption-growth forecast errors propagate to the GDP forecasts, for consumption constitutes 55% of Germany's GDP—by far its largest component.

To test whether the predictable consumption-growth forecast errors are due only to the corresponding GDP-growth forecast errors, we also regress the former on the latter plus the change in the savings ratio. We find that the last variable has significant explanatory power for the consumption-growth forecast errors in addition to that of the

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GDP-growth forecast errors. This suggests that the former errors are not driven exclusively by the latter and, thus, provides further evidence of consumption surges during which consumption grows faster than justified by contemporaneous income growth. GDP forecasts are used as a proxy of disposable income forecasts.

To better appreciate the intuition and evidence about predictable forecast errors, the OECD forecasts are produced using the whole battery of techniques employed by professional forecasters, including simulations with macroeconomic models, here OECD's *Interlink*, the information of leading indicators of consumer confidence, plus judgmental input by country and sector specialists. In addition, they have been subjected to rigorous statistical tests that did not reveal any significant inefficiency, bias or inconsistency (see Ash et al., 1990).

The remainder of the paper is organized as follows. Section 2 presents the conceptual framework and discusses the data. Section 3 presents the evidence about predictable consumption and GDP-growth forecast errors, while Section 4 concludes. Throughout the paper, and owing to its empirical nature, special emphasis is placed on the intuitive aspects of the analysis.

2   Conceptual framework and data

2.1   Conceptual framework

As aforesaid, Campbell and Mankiw (1990, 1991) document that consumption growth in the major industrial countries—far from being unpredictable as the *Permanent Income Hypothesis* (PIH) postulates—is correlated with contemporaneous income growth. Their estimated equations have the form

$$C_t = \alpha + \beta \cdot Y_t + \epsilon_t, \tag{1}$$

where C_t and Y_t stand for (per capital) consumption and income growth, α and β are regression coefficients, and ϵ_t denotes the usual stochastic term. β, the so-called 'excess sensitivity' coefficient, is positive and its statistical significance underlines the extensively documented rejection of the PIH.

Campbell and Mankiw's regressions allude to a time-invariant relationship between consumption and income growth, with no cyclical variation. Such a relationship, if true, precludes the existence of non-linear dynamics and of the associated consumption surges. In addition, it leaves little room for predictable forecast errors for the 'true' β, that presumably exists, can be readily estimated from historical data.

Yet, Antzoulatos (1994b) and Caballero (1995) present evidence for non-linear consumption dynamics in the major industrial countries, characterized by occasional surges. They also develop theoretical models to reconcile these dynamics with rational, forward-looking behavior by consumers.

These surges imply that the 'excess sensitivity' coefficient is not constant, but varies over time in a predictable cyclical way. More importantly, they hold the promise of predictable consumption surges which, it turn, may lead to better consumption—and more generally—better macroeconomic forecasts. Intuitively, the forecasts which are based on the 'average' consumption to income ratio—like the forecasts based on econometric models or on Campbell and Mankiw's β—will tend to underpredict consumption (and consumption growth) during the surge periods and overpredict it during the remaining.

To simplify the discussion, without sacrificing rigor, let β take two values, high and low, β^H and β^L, with probabilities π^H and π^L $(\pi^H + \pi^L = 1)$. Suppose next that equation (1) is estimated with historical data and used—as in the case of forecasting based on econometric models—for forecasting purposes. The estimated coefficient α will be equal to the actual one, while the estimated 'excess sensitivity' coefficient will satisfy $\beta = \pi^H \cdot \beta^H + \pi^L \cdot \beta^L$ and $\beta^L < \beta < \beta^H$.

The forecasts generated by this equation will be (E_{t-1}, the usual expectations operator, is used here to denote forecasts at $t - 1$):

$$E_{t-1}C_t = \alpha + \beta \cdot E_{t-1}Y_t. \tag{2}$$

For the periods of consumption surges, when β^H applies, actual consumption growth will be $C_t = \alpha + \beta^H \cdot Y_t + \epsilon_t, Y_t = E_{t-1}Y_t + \eta_t$ (η_t is the income-growth forecast error), and the consumption-growth forecast error will be

$$
\begin{aligned}
e_t &= C_t - E_{t-1}C_t = (\alpha + \beta^H \cdot Y_t + \epsilon_t) - (\alpha + \beta \cdot E_{t-1}Y_t) \\
&= (\beta^H - \beta) \cdot E_{t-1}Y_t + \beta^H \cdot \eta_t + \epsilon_t.
\end{aligned}
\tag{3}
$$

Similarly, one can estimate the forecast errors for the remaining periods.

The promise of better forecasts is related to the term $(\beta^H - \beta) \cdot E_{t-1}Y_t$. In it, $E_{t-1}Y_t$ is known (we use the OECD's own GDP-growth forecasts as proxies of income-growth forecasts). Thus, for this promise to materialize, the periods of a likely surge must be identified. Based on Antzoulatos (1994b) and Caballero (1995), Antzoulatos (1996) identifies a rising ratio of consumer installment credit to disposable income as a surge indicator in his evaluation of the OECD consumption-growth forecasts for the US. The basic idea is that forward-looking individuals will borrow in good times, in anticipation

of higher income ahead.[1]

There are three subtle issues pertaining to the analysis above. First, the time-varying 'excess sensitivity' coefficient is likely to take values from some distribution with mean β. Thus, the term that holds the promise of better consumption-growth forecasts will be $(\beta_t - \beta) \cdot E_{t-1}Y_t$. This raises the prospect of having to estimate $(\beta_t - \beta)$ every period—a challenging endeavor even without considering the fact that we do not even know the β used in the preparation of the forecasts. Fortunately, as discussed below, it is sufficient for the purposes of this paper to identify the likely periods of positive $(\beta_t - \beta)$. Due to this shortcut, the potential for forecast improvement is likely to be larger than that suggested by the statistical results in the next two sections.

Second, the fact that $(\beta_t - \beta)$ has (by construction) zero mean may lead to the false conclusion that the forecasts under scrutiny are efficient, i.e. have zero mean forecast error, despite that their errors may contain predictable components. Using the above example, the predictable components of the forecast errors—$(\beta^H - \beta) \cdot E_{t-1}Y_t$ during surge periods and $(\beta^L - \beta) \cdot E_{t-1}Y_t$ during the remaining—will tend to cancel out if one puts together all the observations, thus giving the impression that the forecasts under scrutiny are efficient. This may explain why several studies have found that the OECD forecasts are efficient.

Third, the term $\beta^H \cdot \eta_t$ in equation (3) can help explore whether the consumption-growth forecast error, e_t, is driven—or, better, associated with, for we do not know whether e_t causes η_t, or the other way around—by the GDP-growth forecast error, η_t. To do so, one can regress e_t on η_t and a variable that captures the effect of $(\beta^H - \beta) \cdot E_{t-1}Y_t$. A statistically significant and positive coefficient for the last term would provide evidence of consumption surges (for consumption grows faster than justified by contemporaneous income growth) which are not taken sufficiently into account by the forecasts under scrutiny.

Turning to the OECD forecasts, they incorporate judgmental input by country and sector specialists in addition to simulations with *Interlink*. With Campbell and Mankiw's framework in mind, this forecast-generating process can be represented as

$$F_t = \alpha + \beta \cdot E_{t-1}Y_t + \gamma \cdot Z_t, \tag{4}$$

where Z_t stands for the vector of variables associated with the judgmental input, while

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[1]Also, a rising debt-to-income ratio may be the product of financial liberalization which increases consumer access to credit (for a theoretical analysis see Antzoulatos, 1994a). Yet, even in this case, a rising ratio, if not sufficiently taken into account in forecasting, will lead to consumption underprediction.

γ is its coefficient-vector.

The forecast error generated by the above process during surge periods will be

$$
\begin{aligned}
e_t &= C_t - F_t = (\alpha + \beta^H \cdot Y_t + \epsilon_t) - (\alpha + \beta \cdot E_{t\,1} Y_t + \gamma \cdot Z_t) \\
&= (\beta^H - \beta) \cdot E_{t-1} Y_t + \beta^H \cdot \eta_t - \gamma \cdot Z_t + \epsilon_t.
\end{aligned}
\tag{5}
$$

To the extent that the judgmental input in the OECD forecasts does not fully capture the consumption surge—i.e. the terms $(\beta^H - \beta) \cdot E_{t-1} Y_t$ and $-\gamma \cdot Z_t$ do not cancel out—there is room for forecast improvement. In other words, as long as the consumption surges are not taken sufficiently into account in forecasting either econometrically (reflected on $(\beta^H - \beta)$) or judgmentally (reflected on $-\gamma \cdot Z_t$)—the process will tend to underpredict consumption during surge periods.

2.2   Data

The above intuition is tested with the OECD's forecasts for Germany, which are readily available in the *OECD Economic Outlook* and also receive a lot of attention by policy-makers and financial-market participants. Starting in 1967, the *Outlook* has been published twice a year, in May/June and in December. The issue pertaining to the tth semi-year (alternatively called *period*) reports, among other figures, consumption, GNP/GDP and investment growth forecasts for the current semi-year and two to three periods ahead, as well as estimates of the growth rates for the preceding two periods. All the growth rates are real, at annual rates and seasonally adjusted. Starting, however, in May 1998, the *Outlook* reports growth rates for whole years, not for semi-years. In order to have as many observations as possible, the post-1998 forecasts are included in the analysis. Nevertheless, the results are virtually the same when the sample ends in the second semi-year of 1997.

$E_t C_t$, the consumption growth forecast for period t reported in the tth semi-year issue of the *Outlook* is a genuine forecast, albeit a short-run one. This is so because it takes several months after the end of a semi-year to collect and analyze data pertaining to it and, additionally, there is a considerable lag between the end of a period and the time a coherent picture for it is put together. The forecasts for periods $t + j$ ($j = 1, 2, \ldots$) are denoted as $E_t C_{t+j}$. The symbols for the corresponding GNP/GDP growth forecasts are $E_t Y_t$ and $E_t Y_{t+j}$.

In line with common practice (see, for example, Ash et al., 1990), the consumption growth forecast error is calculated as the difference between the consumption-growth estimate for period t reported at $t + 1$ (first available estimate) minus the forecast

reported at t:

$$CERROR_t = E_{t+1}C_t - E_tC_t.$$

Note that, even though the first available estimate for consumption growth at t, $E_{t+1}C_t$, will be revised in subsequent periods (and issues of the *Outlook*), i.e. in $t+2, t+3, \ldots$, this estimate is not a mere guess. It reflects a substantial amount of information gathered for more than four months after the end of the tth semi-year. In addition, it is what the OECD staff have in mind while preparing the forecasts for the subsequent periods and what the financial markets pay most attention to.

During the sample period, 1967:1 – 2000:2, the base year changed six times, in 1977:2, 1982:2, 1985:2, 1991:2, 1992:2 and 1999:2. Since base-year changes affect the estimates of the forecast error for these periods, for $E_{t+1}C_t$ and E_tC_t correspond to different base years, these periods are not included in the analysis.

Unlike Antzoulatos (1996), who uses the ratio of consumer installment credit to personal income to create the consumption-surge indicator, we use the ratio of personal saving to disposable income (henceforth savings ratio). The reason is that the 'bank lending to households' series in *Datastream* exhibit discontinuities and also lack sufficient cyclicality to be useful in our analysis. In contrast, the savings ratio exhibits both of these two desirable traits. The conceptual link with Antzoulatos' (1996) analysis is that rising consumer debt is associated with falling savings ratio.

Figure 1 exhibits the savings ratio. Both series involved, i.e. personal savings and disposable income, are quarterly, in current DM (euros after 1998) and not seasonally adjusted; and they are retrieved from *Datastream*.

Let $S_{t,Q1}$ denote the savings ratio for the first quarter of semi-year t. Taking into account that $S_{t,Q1}$ is not seasonally adjusted, the surge indicator at t, denoted by $SURGE_t$, is calculated as

$$SURGE_t = \begin{cases} 1 & \text{if } S_{t,Q1} < S_{t-2,Q1} \\ 0 & \text{otherwise} \end{cases}.$$

In other words, a consumption surge will be expected at t, if the savings ratio during the first quarter of the semi-year has declined relative to its value one year (two semi-years) ago. For example, if the savings ratio in the third quarter of 2000 (second semi-year of 2000; $t = 2000 : 2$) declined relative to its value in the same quarter of 1999, $SURGE_{2000:2} = 1$. The information pertaining to $SURGE_{2000:2}$ is dated September 2000, while the forecasts for $t = 2000 : 2$ use information up to November 2000.

Consistent with the forward-looking nature of consumption, the condition for a likely underprediction ($SURGE_t = 1$) is also strengthened with optimistic income expecta-
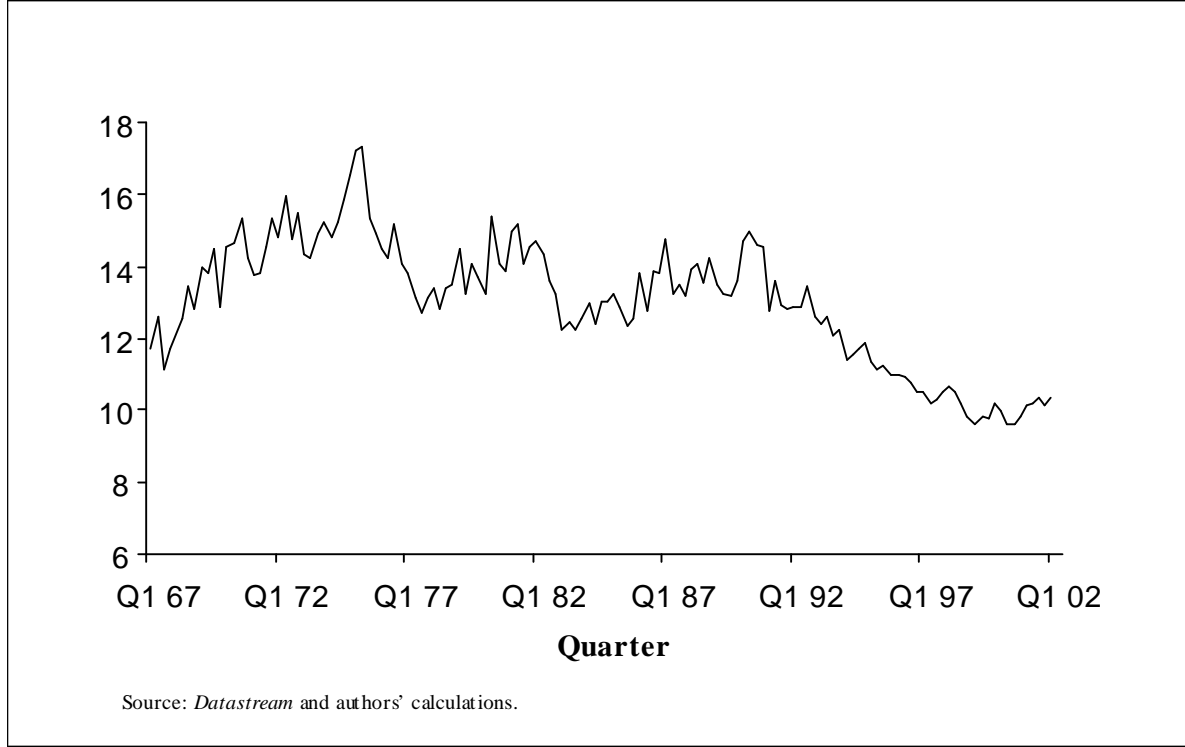
Figure 1: Ratio, personal savings to disposable income (in percent)

tions, the rationale being that a falling savings ratio is more likely to indicate a surge ahead in good times than in bad times. During the latter, people may decrease savings in order to maintain living standards, something that does not foretell a consumption surge.

Optimistic income expectations are captured here in two ways. First, expected GDP-growth acceleration at t relative to $t-1$, in which case the condition for the surge indicator becomes

$$SURGE_t = \begin{cases} 1 & \text{if } S_{t,Q1} < S_{t-2,Q1} \text{ and } E_t Y_t > E_t Y_{t-1} \\ 0 & \text{otherwise} \end{cases},$$

and upward revision of GDP-growth forecasts for period t, in which case

$$SURGE_t = \begin{cases} 1 & \text{if } S_{t,Q1} < S_{t-2,Q1} \text{ and } E_t Y_t > E_{t-1} Y_t \\ 0 & \text{otherwise} \end{cases}.$$

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3 Empirical results: consumption and GDP forecasts

3.1 Consumption-growth forecasts

Table 1 summarizes the results for the consumption-growth forecast errors. The first column shows the condition for an expected consumption surge at t. The next three columns present statistics for the sub-sample for which a surge is expected; i.e. when $SURGE_t = 1$. In particular, the first from the three columns reports the mean forecast error (m.f.e.), its variance and the p-value for the hypothesis that m.f.e. is equal to zero. The second and third columns report the numbers of the observed positive and negative errors. The next three columns show the same information for the $SURGE_t = 0$ sub-sample, and the last one the p-value for the test that the m.f.e. of the $SURGE_t = 1$ sub-sample is less than that of the other. Since the conceptual framework indicates that the m.f.e. for the two sub-samples should respectively be positive and negative, the appropriate p-values are for one-sided tests.[2]

To properly evaluate the statistics for the two sub-samples, one has to compare them with those for the whole sample. As the *Memorandum* item at the end of Table 1 indicates, with all the observations together there is no evidence of inefficiency in the consumption-growth forecasts: the m.f.e. is 0.07%, insignificant at all conventional levels (t-statistic = 0.39). In addition, the positive errors, 36, outnumber the negative ones, 25, by a factor of about 9-to-6.

Yet, splitting the sample as suggested by the conceptual framework, reveals evidence of predictable forecast errors. In greater detail, the first row of Table 1 shows the results when the periods of a likely consumption surge—and, hence, consumption underprediction—are identified as those of a falling savings ratio. In mathematical terms, $SURGE_t = 1$ if $S_{t,Q1} < S_{t-2,Q1}$. Compared with the whole sample, the m.f.e. rises to 0.33%, which is significantly greater than zero at the 6%-level (p-value=0.06). Also, the positive errors, 23, outnumber the negative ones, 12, by a factor of almost 2—greater than the corresponding factor for all observations. As for the remaining observations, i.e. the $SURGE_t = 0$ sub-sample, the m.f.e. declines to -0.29%, which is insignificant (p-value=0.21), while the ratio of the positive to negative errors declines relative to the whole sample to 13-to-13. Furthermore, the hypothesis that the m.f.e. of the $SURGE_t = 1$ sub-sample is less than that of the $SURGE_t = 0$ sub-sample, is rejected at the 5%-level (p-value=0.05).

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[2]All statistical terms and concepts used in this paper refer to standard probability calculus. For an appropriate introduction and overview see, for example, Rice (1995).

Table 1: Consumption-growth forecast errors

Condition for $SURGE_t = 1$	Sub-sample: $SURGE_t = 1$ Expected errors: positive			Sub-sample: $SURGE_t = 0$ Expected errors: negative			p-value for $e^+ - e^- < 0$
	Mean [%] Variance p-value	Number of observed values positive	negative	Mean [%] Variance p-value	Number of observed values positive	negative	
Falling savings ratio $S_{t,Q1} < S_{t-2,Q1}$	0.33 1.40 0.06	23	12	−0.29 2.98 0.21	13	13	0.05
Strengthening the condition for $SURGE_t = 1$ with the additional conditions							
Expected GDP-growth accel. $E_tY_t > E_tY_{t-1}$	0.48 0.83 0.03	13	4	−0.08 2.57 0.37	23	21	0.09
Upward GDP-growth forecast revision $E_tY_t > E_{t-1}Y_t$	0.66 1.60 0.03	11	4	−0.18 2.26 0.21	25	21	0.04
Diagnostics: $SURGE_t = 1$ when							
$E_tY_t > E_tY_{t-1}$	0.19 2.13 0.35	21	9	−0.05 2.05 0.24	15	16	0.26
$E_tY_t > E_{t-1}Y_t$	0.36 1.86 0.09	18	10	−0.18 2.29 0.26	19	15	0.05
Memorandum: Statistics for *all* observations: Mean forecast error: 0.07, t-statistic: 0.39, number of positive/negative errors: 36/25							

Notes:

1. Sample: 1967:1 – 2000:2.

2. Symbols:

   - $SURGE_t = 1$: Indicator of expected consumption surge at date t,
   - $S_{t,Q1}$: Savings ratio in the first quarter of the tth semi-year,
   - $E_{t-j}Y_{t-k}$: Expected GDP growth for the period $t - k$ as of period $t - j$,
   - e^+ and e^-: Mean forecast errors for sub-samples $SURGE_t = 1$ and $SURGE_t = 0$.

3. Data sources: *OECD Economic Outlook* (various issues), *Datastream*, and authors' calculations.

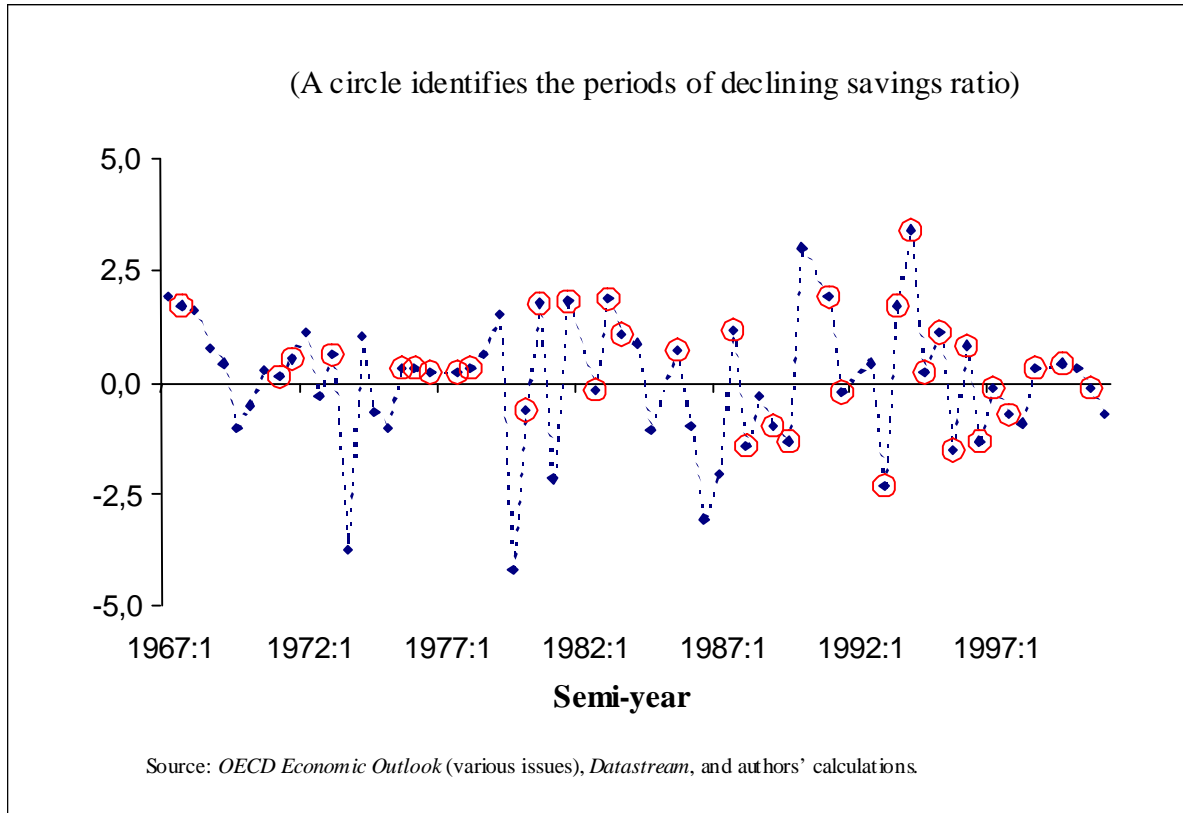4. The p-values are for one-sided tests.

Figure 2: Consumption-growth forecast errors

The above statistical evidence is further highlighted by the visual evidence in Figure 2 (which exhibits the consumption-growth forecast errors). In it, a circle identifies the $SURGE_t = 1$ periods. To begin with, the surge indicator seems to foretell most of the big positive errors; with the exception of the 1967:1, 1968:1, 1978:2 and 1990:1 errors, respectively 1.9%, 1.6%, 1.5% and 3.0%, all the errors in excess of 1.5% are captured by the surge indicator. In addition, the $SURGE_t = 1$ indicator correctly misses most of the biggest (in absolute value) negative forecast errors. With the exception of 1993:1, 1995:2 and 2000:2, with respective errors -2.3%, -1.5% and -1.9%, this indicator misses all the negative errors in excess of -1.5%. It is worth pointing out that these wrong signals occurred in the tumultuous period (in a macroeconomic sense) following Germany's unification and in the second half of the 1990s during which there seems to exist a structural decline in Germany's savings ratio.

Strengthening the condition for a likely underprediction with the additional condition of GDP-growth acceleration at date t, i.e. $E_t Y_t > E_t Y_{t-1}$, produces stronger results (in the second row of Table 1) than in the previous case. The m.f.e. for the $SURGE_t = 1$ sub-sample rises to 0.48% with a p-value of 0.03, the positive errors, 13, outnumber the

negative ones, 4, by a factor of greater than 3, while the hypothesis that the m.f.e. of the $SURGE_t = 1$ sub-sample is less than that of the $SURGE_t = 0$ sub-sample, is rejected at the 9%-level (p-value=0.09).

The strongest results are produced when the condition for a likely underprediction is strengthened with the additional condition of upward GDP-growth revision, i.e. $E_t Y_t > E_{t-1} Y_t$. The results are shown in row 3 of Table 1. The m.f.e. rises to 0.66%, with a p-value of 0.03, the positive errors, 11, outnumber the negative ones, 4, by a factor of almost 3, while the hypothesis that the m.f.e. of the $SURGE_t = 1$ sub-sample is less than that of the $SURGE_t = 0$ sub-sample is rejected at the 4%-level (p-value=0.04).

To check whether the results in the last two cases are due to the additional conditions, i.e. to $E_t Y_t > E_t Y_{t-1}$ and $E_t Y_t > E_{t-1} Y_t$, and not to the declining savings ratio, the diagnostics in the last two rows of Table 1 report the results when the sample is split according to these two conditions only. As can be seen, the evidence about predictable forecast errors associated with these two conditions is much weaker than in all three previous cases. Briefly, the statistics in row 4, i.e. the m.f.e. for the $SURGE_t = 1$ sub-sample, its p-value and the p-value for the hypothesis that the m.f.e. of the $SURGE_t = 1$ sub-sample is less than that of the $SURGE_t = 0$ sub-sample, are weaker than those in row 2. The same holds for the statistics in row 5 relative to those in row 3.

3.2   GDP-growth forecasts

Since consumption is by far the largest component of GDP, the predictable forecast errors for the former documented above may be associated with similar errors for the latter. Table 2, which summarizes the results for the GDP-growth forecasts in a format similar to that in Table 1, confirms this expectation.

To begin with, it seems that the GDP-growth forecasts are less efficient than the consumption-growth ones, but the inefficiency is weak: with all the observations together, the m.f.e. is 0.22% with a t-statistic of 1.30, while the positive errors outnumber the negative ones by a factor of 35-to-26.

Splitting the sample produced significantly positive m.f.e. for the periods of a likely underprediction (rows 1, 2 and 3). This evidence is stronger than in the two diagnostics-cases (rows 4 and 5), indicating that the declining savings ratio has indeed significant capacity for the GDP-growth forecasts.

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Table 2: GDP-growth forecast errors

	Sub-sample: $SURGE_t = 1$ Expected errors: positive			Sub-sample: $SURGE_t = 0$ Expected errors: negative			
Condition for $SURGE_t = 1$	Mean [%] Variance p-value	Number of observed values positive	negative	Mean [%] Variance p-value	Number of observed values positive	negative	p-value for $e^+ - e^- < 0$
Falling savings ratio $S_{t,Q1} < S_{t-2,Q1}$	0.55 1.80 0.01	24	11	-0.22 1.81 0.21	11	15	0.02
Strengthening the condition for $SURGE_t = 1$ with the additional conditions							
Expected GDP-growth accel. $E_t Y_t > E_t Y_{t-1}$	0.60 1.61 0.04	13	4	0.08 1.97 0.36	22	22	0.09
Upward GDP-growth forecast revision $E_t Y_t > E_{t-1} Y_t$	0.86 2.20 0.03	11	4	0.01 1.66 0.47	24	22	0.02
Diagnostics: $SURGE_t = 1$ when							
$E_t Y_t > E_t Y_{t-1}$	0.49 1.70 0.03	21	9	-0.03 2.00 0.45	14	17	0.07
$E_t Y_t > E_{t-1} Y_t$	0.50 2.37 0.05	17	11	-0.02 1.43 0.47	18	15	0.08

Memorandum: Statistics for *all* observations:
  Mean forecast error: 0.22, t-statistic: 1.30, number of positive/negative errors: 35/26

Notes:

1. Sample: 1967:1 – 2000:2.

2. Symbols:

   - $SURGE_t = 1$: Indicator of expected consumption surge at date t,
   - $S_{t,Q1}$: Savings ratio in the first quarter of the tth semi-year,
   - $E_{t-j} Y_{t-k}$: Expected GDP growth for the period $t - k$ as of period $t - j$,
   - e^+ and e^-: Mean forecast errors for sub-samples $SURGE_t = 1$ and $SURGE_t = 0$.

3. Data sources: *OECD Economic Outlook* (various issues), *Datastream*, and authors' calculations.

4. The p-values are for one-sided tests.

3.3 Further evidence of non-linear consumption dynamics

The capacity of the $SURGE_t = 1$ indicator to identify periods of predictable consumption and GDP-growth forecast errors not withstanding, there is the possibility that the former errors are caused by the latter, in which case the conceptual foundations of the analysis above could be questioned. As aforesaid, this can be tested by regressing $CERROR_t$ on $YERROR_t$ plus on a term that captures the consumption-surge effect ($YERROR_t$ stands for the GDP-growth forecast error).

The two regression equations below, in which one, two and three asterisks (*) indicate significance at respectively the 10%-, 5%- and 1%-level, indicate that this last term is statistically significant. In greater detail, in the first equation, the $SURGE_t = 1$ indicator is significant at the 5%-level and negative. That is, a falling savings ratio is associated with a positive consumption-growth forecast error, as one would expect based both on the theory and the results in Table 1.

$$CERROR_t = \begin{array}{cccc} -0.033 & - & 0.382 \cdot SURGE_t & + & u_t \\ (-0.18) & & (-2.27)^{**} \end{array}$$

$$\text{Adj. } R^2 = 0.08, \quad D.W. = 2.23$$

In the second equation, the GDP-growth forecast error is positive and significant at the 1%-level, but it does not render the $SURGE_t = 1$ indicator insignificant. The latter remains negative though its significance declines to 10%:

$$CERROR_t = \begin{array}{ccccccc} -0.084 & + & 0.400 \cdot YERROR_t & - & 0.269 \cdot SURGE_t & + & u_t \\ (-0.49) & & (3.16)^{***} & & (-1,67)^{*} \end{array}$$

$$\text{Adj. } R^2 = 0.19, \quad D.W. = 2.23$$

4 Brief concluding remarks

All in all, and taking into account that the OECD forecasts incorporate judgmental input by country and sector specialists plus the information of leading indicators of consumer confidence, the evidence in the second equation about non-linear consumption dynamics and the associated predictable consumption surges is stronger than indicated by the 10% significance level of the $SURGE_t = 1$ indicator. Those surges may also be foretold by a rising consumer confidence index—what households say (in contrast to a falling savings ratio—what they do). In another test, we used a rising consumer confidence index as an indicator of a consumption surge ahead. The results did not produce

any evidence of predictable forecast errors either for consumption or GDP-growth errors. This may reflect that information of this indicator is adequately captured by the OECD forecasts, or that it may not be a good surge indicator afterall. Whatever is true, the evidence in this paper suggests that identifying surge periods is a worthwhile endeavor as is repeating the analysis for the forecasts of other institutions.

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