The determinants of consumer confidence: the case of United States and Belgium

Helena Beltran Lopez[1] and Alain Durré[2]

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[1]FNRS research fellow, Center for Operations Research and Econometrics (CORE), and Department of Economics, Université catholique de Louvain (UCL).

[2]*IRES*-Université catholique de Louvain (UCL), *IéSEG*-Université catholique de Lille, LABORES (URA 362 du CNRS-France) and National Bank of Belgium (Research Department).

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The authors would like to thank Luc Bauwens for useful remarks and suggestions. Corresponding author: Helena Beltran, beltran@core.ucl.ac.be, tel.: +32 10 47 81 60, fax: +32 10 47 43 01.

Abstract

The paper is dealing with the controversial question of the potential impact of stock market fluctuations on consumer confidence. In the last few years, this confidence index has gained importance in business cycle analysis and empirical evidence has shown its explanatory power in forecasting consumption along with standard macroeconomic variables. Meanwhile, numerous interpretations of its fluctuations arose, and few were based on a solid argumentation. Therefore, we propose in this paper to determine which elements are actually driving the confidence index. Using the standard error-correction mechanism model and non-linear methods, we analyze the relationship between the confidence index and several economic variables, over the period ranging from January 1983 to December 2001. As a growing number of economic observers claim the stock market fluctuations have a strong impact on consumer confidence, we especially focus on this potential impact. The models are estimated for the United States and for Belgium for which the importance of equities in the households net wealth is quite different. We find in particular that stock market fluctuations have explanatory power in the evolution of consumer confidence in the United States, especially since the beginning of the nineties.

JEL classification: C11, C42, D12

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1 Introduction

Although there remains some confusion about the forces driving the consumer confidence index, its role in business cycle analysis has been deeply increasing recently. This fact is indeed supported by the large consensus today over the explanatory power of this index in modelling real consumption. In particular, some authors showed that the inclusion of the consumer confidence index improves the forecasts of real consumption. This result seems to be true for the United States and for Europe as well (Carroll, Fuhrer, and Wilcox, 1994; Bram and Ludvigson, 1998; Buffeteau and Mora, 2000). Recently, there has been also a growing interest in the literature in the understanding of the parameters that may influence this index. Authors as Blanchard (1998) underlines the sensitivity of consumers to 'psychological' factors (called 'animal spirits') and their potentially strong impact on the business cycle, but few studies, if any, try to point out the main factors of consumer confidence. Of course, one knows that this index is based on surveys in which households give their expectations for income, unemployment and economic situation. But, one usually ignores in fact if the empirical evidence supports the expected link between the survey results and the macroeconomic variables. Taking into account the higher variability of the confidence index across months than the macroeconomic variables, households may be affected by other variables not explicitly taken into account in the survey. On this point, one think especially of the evolution on the equity markets.

The most important feature of the confidence index is probably the leading information it contains with respect to the main determinants of real consumption: it is the first published information on the consumer behavior. As such, most economic agents integrate it in their forecasting (for instance, stock markets react very quickly to the release of the confidence index, as it gives an indication of future consumption and thus future growth; in the same way, central bankers decisions to modify the monetary policy is partly based on the evolution of this index). The knowledge of the parameters affecting this index might allow to infer better its importance in terms of consumption. Moreover, if the variables affecting the confidence are changing over time, it is of prime importance to detect it quickly in order to interpret its fluctuations correctly and thus to assess how relevant they are for your analysis. That could be the case for the equity market for instance. The actual weight of equities in households net financial wealth appears quite limited (see infra) compared to other assets (real estate, bonds). Therefore, for some

people the impact of stock market fluctuations on consumers behavior is marginal. However, the growing accessibility of financial news and the growing knowledge of the stock market could influence consumers expectations about the future business cycle. Two potential effects (i.e. the wealth effect and this 'proxy' effect) might be contained in the fluctuations of the confidence index. Indeed, a great number of forecasters explained the decrease in the confidence during the recent years by gloomy stock markets perspectives.

The objective of the paper is thus twofold. First, we try to identify the main economic variables that are driving the consumer confidence. Second, according to the growing role played by the stock market during the nineties, we check if households may have been influenced by equity prices fluctuations in their expectations on economic developments. We estimate error-correction mechanism (ECM) and non-linear models for the United States and Belgium from the beginning of the eighties to the end of 2001. The analysis of these two countries is motivated by the different penetration of equity markets in the households financial investments.

The results are the following. First, we find that the parameters affecting the confidence are strongly changing over time. In other words, it is not correct to explain the variation of the confidence in the same manner today as during the eighties. Indeed, economic variables of business cycle (such as growth indicator and wages) seem to be the main forces that have driven the confidence index during the eighties. Moreover, during this period the information from the stock prices fluctuations overlaps the one contained in the growth indicator. We then observe a structural break in the beginning of the nineties. In particular, the confidence index seems to be explained by more variables than during the previous decade. Concerning the potential role of equity prices fluctuations in the behavior of the households confidence, we find different results for the United States and Belgium. Indeed, variations of household confidence are explained by the stock market fluctuations in the United States while this impact for Belgian households confidence does not appear significant.

The paper is organized as follows. First, we define the confidence index and show how this index is built in practice. Second, we discuss the potential link between stock market fluctuations and the consumer confidence. The basic model for both countries is presented in section 3 with the results and their economic interpretation. In section 4, we analyze in depth the structural break by means of Bayesian non linear methods. Finally, section 5 offers some

concluding remarks.

2 The consumer confidence indicator

2.1 The 'confidence channel'

In most countries, the consumer confidence index is an unweighed average of several questions about (past and future) economic and financial situations. The US confidence index developed by the University of Michigan is an unweighed average of 5 questions: the evolution of own finances during the last and future 12 months, economic situation for the next 12 months and 5 years[1], and the opportunity to purchase big items.

Consumer confidence indicators were first developed by Katona during the 1950's (see Katona, 1975). He stressed there could exist psychological parameters besides the economic ones. Broadly speaking, Katona suggests the existence of two specific trends in the consumption behavior of the household. The first one, specified as an objective factor, is related to the 'traditional' economic factors or the 'ability to buy'. The second one, more subjective, is what Katona called 'the willingness to buy', i.e. consumers sentiment in favor of an increase of expenditures. While the objective factor depends on the cost of consumption and the financial resources of consumers, the subjective factor may influence consumption in a more subtle way given the household perspectives about the near future in the economy. The 'willingness to buy' is exactly what the consumer confidence index tries to capture.

It is not easy to define what the willingness to buy, and therefore the consumer confidence indexes, accounts for. From a theoretical point of view, the willingness to buy is just consumers'expectations about future income flows. In that case, consumer confidence should depend on the economic variables typically used when estimating consumption equations. It could also measure to some extent the uncertainty about the accuracy of their forecasts of future economic variables. In that case, a decrease in confidence should lead to an increase in precautionary savings (see Carroll, Fuhrer, and Wilcox, 1994).

[1]For the European Union, and Belgium in particular, the index is an unweighed average of the same questions, except that the duration in the question about future economic condition is 12 months instead of 5 years (see European Commission, 2001).

The willingness to buy could also account for non-economic factors such as psychological or political factors. Then it corresponds to what economists call 'animal spirits', i.e. an independent force that drives consumption choices. An illustrative example is given by Blanchard (1998) in his explanation of the 1991-1992 recession. While the macroeconomic indicators enjoyed a positive profile, the confidence of consumers dropped suddenly during the Gulf war involving a weak growth of real consumption during the following quarters.

It is not an easy task to distinguish both factors and to assess which one is prominent in consumer confidence. A straightforward mean is to estimate a consumption function with economic variables as explanatory variables, and then add the consumer confidence index. The increase in the explanatory power of the dependent variable (e.g. as measured by the R^2) will then be due to non objective factors. Furthermore, to our knowledge, very few empirical studies are available. The first one has been conducted by Carroll, Fuhrer, and Wilcox (1994). These authors show that the consumer confidence cannot be assimilated to expectations, even if this result could be due to the lack of appropriate modelling of consumer behavior. Bram and Ludvigson (1998) try to assess the predictive power of consumer confidence for consumption. They show that the overall index explains 9% of the variations of consumption when controlling for economic variables. Moreover, some questions seem to have more predictive power than others, namely questions about future economic or financial conditions, and questions about job market situation. Dor and Durré (1997) showed for Belgium that the confidence index and the unemployment rate have the same information as explanatory variables of real consumption. For the Euro area, Buffeteau and Mora (2000) show the existence of common trends among such indexes of several countries within a specific zone. They also find that the short-run forecasting of consumption may be well improved by the inclusion of common trends in the consumer confidence index and by the sentiment index of retailers within the area. Here again, the forecasts of consumption based on confidence indexes are more accurate for short periods (from 1 to 3 months) than longer ones. However, they capture relatively well the inflexion in the aggregate consumption which is the most important feature in the forecasting exercise.

It is beyond the scope of this paper to assess the main regressors of real consumption; moreover, numerous papers have been dealing with this issue. At this stage, given the importance of the confidence index in the business cycle and financial analysis, the point here is to determine

which parameters can explain the consumer confidence.

2.2 Stylized facts

As discussed in the previous section, consumer sentiment is a mixture of expectations and psychological factors. We cannot find proxies for the psychological effects in our analysis. With respect to expectations, two types of variables could influence consumer sentiment. The first group contains variables linked to the business cycle: a business cycle indicator, unemployment, interest rates and stock markets. The second group contains variables linked to households income and wealth: salary, interest rates, expected inflation, and also stock markets.

In a preliminary descriptive (correlation) analysis, we check among all potential economic variables the ones having the stronger link with the global confidence index and its sub-questions. Among potential competing candidates, we selected the first available variable as it enables decision-makers to better assess which variables determined the latest fluctuations of the confidence index. Indeed, we did not retain the GDP growth, but the ISM index[2], arguing that the latter is available several months before. We also retained the real hourly wages, the interest rates (short- and long-terms), the unemployment rate, the inflation rate and the employment level. Beside these standard variables, we also check the relationship between the confidence index and the stock market index. All these variables are transformed in terms of annual growth to ensure stationarity, except the interest rates, the unemployment rate and the ISM index. Table 1 summarizes the correlation results.

Insert table 1 about here

As shown by table 1, the confidence index seems to display a strong relationship with real variables such as private consumption, the ISM index, the employment, the unemployment rate, stock prices and real wages over the sample 1979-2001. Moreover, the confidence index from the Michigan University seems to have a stronger relationship with real consumption than the index

[2]The ISM index is the former NAPM index (see footnote in table 1 for additional information on the 2 indexes). As shown in table 3, the correlation between the ISM and GDP growth is high and stable during the period under review.

from the Conference Board[3], which differs from the arguments of Bram and Ludvigson (1998). Furthermore, the relationship with the consumption appears to be more stable with the index of Michigan that with the index of the Conference Board.

Concerning the correlation with the real economic variables, several features must be underlined. First, in general the correlation differs following the sub-periods and in general it is higher on the last decade, 1990-2001, except for real wages. We may indeed wonder how to explain the very low correlation between the confidence index and the real wages growth ($d12mich/d12salr$) over the period 1995-2001. Two potential elements may explain such results. On the one hand, that may reflect a level effect so that in period of economic booms with rising benefits the agents pay less attention to the salary growth itself. On the other hand, this may also come from the increasing use of stock options by firms during this period, entailing a higher capital participation of employees in their own firm. Second, the correlation between the confidence index and the employment growth ($d12mich/d12l$) increased in recent years, and was much higher since 1995 than the average over the last decade and almost 4 times higher than the average over the whole sample, 1979-2001. Third, the correlation between the confidence index and the inflation ($d12mich/\pi$) was on average -0.20 over the sample but, surprisingly, it reached a pick at -0.43 during the last decade. We may also point out the correlation of the confidence index with the acceleration of the inflation, $d12mich/d\pi$ (not reported in table 1), is lower than expected, around -0.11 over the whole sample. Turning now to the correlation with the financial variables, we may note the ambiguous effect of interest rates on the confidence. While the short-term interest rate does not seem to be highly correlated with the consumer confidence ($d12mich/d12fedf$), the correlation for the long-term interest rate ($d12mich/d12\_10yield$) appears to be only higher during the last 5 years of the decade.

Concerning the correlation analysis on Belgian data, we obtained similar results with a correlation between the annual variations of the confidence index and the business cycle index at 0.6 during the period 1983-2001. Nevertheless, two main differences must be underlined in comparison with the results obtained for the United States. First, the correlation between these two variables displays quite different results among the sub-periods with a correlation at only 0.23 during the eighties while it grew at 0.64 during the nineties. Second, the correlation between

[3]The Conference Board releases every month another US consumer confidence index. The two US indicators display close patterns. See Bram and Ludvigson (1998) for a comparison.

the confidence index and the unemployment rate (both defined in annual growth) is higher (0.5) and more stable across decades.

2.3 Stock markets and the consumer confidence

In this subsection we describe the links between stock markets and the consumer confidence index. The controversial debate on the potential impact on consumers behavior has gained in importance during the nineties, given the strong growth of equity prices. From 1994 to 1997 the Standard & Poor's 500 index more than doubled, and rose another 44% through 1999. Similar trends were observed in Europe as well. Nevertheless, most of empirical studies report a weak wealth effect of stock prices on consumption[4]. If we focus on the United States case for example, many arguments were advanced to explain such results. Among others, we can first underline the weak proportion of stocks holdings in total assets and their strong concentration. Indeed, even if 32% of the total households net worth were owned in equities in 1999 (and 31.2% in 2000, see tables 12 and 13), the dispersion of this ownership across households is quite large as reported in table 2. The top 1% of equity holders accounts for roughly 50% of total households holdings of equities (column 2, including indirect holdings through mutual funds, defined-contribution retirement plans as well as trust accounts). On the other hand, almost 30% of total real estate wealth is held by 80% of households with the lowest holdings. As mentioned by Poterba (2000), this may illustrate that, at first glance, "...for most households, changes in stock prices have modest wealth effects, since they have no or very limited holdings of corporate stocks"[5]. Second, as reported by surveys in Starr-McCluer (2002), the modest effect of wealth gains on current spending may come from the fact that many stockholders mentioned 'retirement saving' in explaining their behaviour[6].

[4]For example in the United States, the marginal propensity to consume out of stock market wealth varies from 0.03 to 0.07, with an effect between one and three years. Note that these results are broadly compatible with the simple life-cycle model (Starr-McCluer, 2002). See also Ludvigson and Steindel (1999).

[5]See Poterba (2000) for details, pp.101-3. These results seem to be corroborated by the Michigan Survey of Consumers presented in Starr-McCluer (2002). In the 1997 survey during the bullish market, 85% of respondents said to be absolutely not influenced by the trends on the stock markets. However, for 12% of respondents, this increasing trend would encourage them to save more.

[6]This potential explanation is also consistent with the fact that 40% of households who own stocks are between 35 and 54 years old (i.e. the first category).

Insert table 2 about here

Nevertheless, the feeling according to which the impact of financial markets on consumers behavior is stronger today than before is widespread, especially among financial markets analysts. Therefore, the only way to reconcile both approaches would be the existence of an 'external influence' from financial markets on consumers behavior. Among potential explanations, there would be the fact that households follow the stock market fluctuations whatever their implications in equity investment, by considering it simply as a proxy of future economic fluctuations. In that case, any prolonged financial crisis could have large and long lasting effects on the business cycle by reducing households' expectations. Still now, this intuition has not been explicitly studied in the empirical literature. The variable apt to capture both effects (including the standard wealth effect and the 'proxy-cycle' effect) is the confidence index of households for which its importance in the business cycle analysis is now well recognized. Before estimating the explanatory variables of this index for the United States and Belgium, we first propose in this section to give some descriptive statistics on the link between the confidence index and some economic variables. For space reasons, this section will be exclusively focused on American figures even if similar results may be found for the Belgian economy.

Insert figure 1 about here

Figure 1 displays the yearly change (yoy) of the growth rate of consumer confidence versus stock market returns. The two series evolve remarkably closely. The simple correlation between the two series is 0.45 (see table 1), and the correlation is much higher at the end of the nineties (0.74). More interestingly, the correlation between the change of the component of the index 'expectations on the economic situation in 12 months' and the growth rate of real stock prices (not reported in table 1) is twice higher than the correlation between the real growth of stock prices and the component 'expectations about financial situation in 12 months', at 0.4. Here again, the former is increasing during the last five years of the nineties[7].

[7]Now, in some forecasting models, the impact of stock markets fluctuations seems to be stronger. As mentioned in the Royal Economic Society Newsletter (2001), the Oxford Economic Forecasting model 'suggests that a fall of 30% in stock prices would lower US growth by about 0.3%, but this ignores (and thus depends critically upon) any secondary effects upon consumer confidence'.

As a first step, this correlation analysis tells us that studying the link between consumer confidence and equity prices fluctuations may make sense. Nevertheless, this correlation may be due to a third variable, for instance the correlation between stock prices and consumer confidence could be due to the correlation of both variables with a third one. In the next section, we will try to answer to this question with the help of the regression analysis.

If we turn now to the link between stock market fluctuations and economic growth, several aspects can be pointed out. A comparison with the correlation between economic growth (i.e. the year on year (yoy) change of industrial production) and the Institute for Supply Management (ISM) index (as being an advanced indicator of the latter) is quite interesting. First, the leading feature of both the ISM and the stock market indexes must be underlined. The correlations of the annual growth rate of the industrial production with the annual growth rate of equity prices and the ISM index in level are stronger with the lagged values of these indexes respectively at time $t-6$ and $t-2$. This result suggests that stock prices seem to be a 6-month leading indicator while the ISM would be an advanced indicator of the industrial production 2 months ahead. Second, it seems particularly obvious that equity prices tend to exacerbate the trend in the economic activity in periods of growth. As we can note, the correlation between the yearly change in stock prices and industrial production differs across the different periods and decades while the correlation between the industrial production and the ISM index is quite stable around 0.7-0.9. The comparison between decades 70-79 and 90-99 is particularly illustrative on this point. During the former period, which enjoyed mostly a weak economic growth (recording two oil shocks), the correlation between the industrial production and equity prices appears relatively strong (around 0.8). On the other hand, during the nineties, the correlation between the stock prices and the business cycle indicator dropped to 0.4. In other words, the equity prices fluctuations seem to be closer to the business cycle during an economic slowdown than during a boom. That could be explained for instance by a systematic exaggeration of expected dividends in periods of prosperity. When the economic growth accelerated between 1995 and 1999, this correlation fell to 0.04 while during the recent economic slowdown in 2000-2001, it grew at 0.9. Figure 2 shows that whereas stock markets and the business cycle[8] were strongly correlated during the eighties, the correlation is not any longer significant during the nineties,

[8]Given the results in table 3, we assume the ISM index is a good proxy of the business cycle.

whatever the lead/lag between these 2 variables.

Insert table 3 about here

Insert figure 2 about here

Therefore, we will assume in the rest of our analysis that stock markets are a good proxy for the cycle during the eighties, but not necessary during the recent period. We should also be aware that even if stock markets are not an objective proxy for the business cycle during some periods of time, *this does not imply that households do not consider stock markets as a good proxy for the cycle*. As said in the BIS Annual Report (2001), "[...] the prices of stocks may now be seen as a leading indicator of productivity in the economy. Thus, they may potentially exert a disproportionate (compared to the real equities ownership by households) influence on consumers' spending decisions". For the period from 1998-2001, the report estimates the short run elasticity between the US consumer confidence index and the stock market index[9] at .133 with 1% level of significance.

Considering that the information from the stock markets is now accessible to a larger number of economic agents, one could imagine that the climate on the financial markets would be progressively interpreted by households as an advanced indicator of the general economic health as well. If that is the case, a stagnation, or even a prolonged depression of stock market prices, as today, would affect the households confidence, whatever their implication in stock markets. Then, in the sequel of this paper, we propose to test the robustness of this assumption.

We decide to make the same analysis for the Belgian economy given the different composition in households net wealth (see table 13). Indeed, Belgian households owned almost 50% of their wealth in fixed-income assets (deposits accounts and bonds) in 2000 while equities represented only 10% of this wealth. Therefore, we can expect a quite weaker wealth effect (if any) in this country contrary to the United States. At first glance, this intuition seems to be supported by the correlation analysis. The correlation of the confidence index and the real stock price index (both defined in annual growth) is lower than for the United States as well. This correlation amounted to 0.2 during 1983-2001 and dropped to 0.1 during the recent period 1995-2001 while it amounted respectively to 0.4 and 0.3 for the United States.

[9]The report is mainly focused on the Nasdaq index in order to see the potential impact of the collapse of technology equity prices on consumption.

3 Econometric analysis

3.1 The dataset

The data are monthly time series spanning the period 1980.1-2001.12. With the exception of the confidence surveys, we obtained the data from the Thomson Financial Datastream (mnemonics follow in parentheses). The dependent variables, i.e. the global consumer confidence index (mich), the 12 months lead and 5 years lead economic situation indexes (siteconm12 and siteconp12) as well as the lead and lagged financial situation indexes (sitfinp12 and sitfinm12) come from the Michigan University available on the website address : http://athena.sca.isr.umich.edu/ for the United States. While some studies attribute a higher performance to the Conference Board index on consumer confidence in forecasting future private consumption (e.g. Bram and Ludvigson, 1998), we use the confidence indexes of the Michigan University for the availability of detailed data.

Among potential explanatory variables, we use the unemployment rate (unemp) and the short-term interest rate (fedf). The latter is represented by the reference rate on the interbanking market, i.e. the Federal Reserve Funds rate. As the long term yield we use the 10-year yields on public bonds (10yield). The inflation measure is the expected inflation rate as given by consumers in the consumers survey of the Michigan university (excpi) and the proxy for business cycle is given by the Institute for Supply Management (ism) in levels. We also use as financial variable the Standard and Poor's 500 price index (sp). Finally, as a proxy of households income, we use the wages in real terms (salr), i.e. deflated by the consumption price index. As some variables will be transformed (e.g. yearly growth rate), the available period for estimation is then 1983.1 to 2001.12. The notation 'dvar' means that the variable is taken in first difference, 'd12var' is the yearly growth rate, and thus 'dd12var' is the first difference of the yearly growth rate. The mnemonics 'spr' indicates that the value of the S&P500 index is deflated by the consumption price index.

All those variables (except ISM) are not stationary according to Augmented Dickey-Fuller (ADF) tests (available upon request). Thus, we can look for a cointegration relationship, and if there is no cointegration, transform the series to obtain stationary variables and estimate an autoregressive distributed lag (ADL) model.

We first tried to find a cointegration relation, but we did not find any for the two decades. We then decided to estimate an ADL model on the yearly growth rate of those variables, as yearly growth rates are stationary:[10]

$$\begin{aligned} d12mich &= c + \sum_{i=1}^{13} \alpha_i d12mich + \sum_{i=0}^{6} \beta_i^1 d12unemp + \sum_{i=0}^{6} \beta_i^2 d12spr \\ &+ \sum_{i=0}^{6} \beta_i^3 ism + \sum_{i=0}^{6} \beta_i^4 d12excpi + \sum_{i=0}^{6} \beta_i^5 d12fedf + \sum_{i=0}^{6} \beta_i^6 d12salr \end{aligned} \quad (1)$$

The equation implies that the long-term equation is (provided that $\alpha = \sum_{i=1}^{13} \alpha_i < 1$):

$$\begin{aligned} d12mich &= c + \frac{\sum_{i=0}^{6} \beta_i^1}{1-\alpha} d12unemp + \frac{\sum_{i=0}^{6} \beta_i^2}{1-\alpha} d12spr \\ &+ \frac{\sum_{i=0}^{6} \beta_i^3}{1-\alpha} ism + \frac{\sum_{i=0}^{6} \beta_i^4}{1-\alpha} d12excpi + \frac{\sum_{i=0}^{6} \beta_i^5}{1-\alpha} d12fedf + \frac{\sum_{i=0}^{6} \beta_i^6}{1-\alpha} d12salr \end{aligned} \quad (2)$$

This equation was estimated by OLS. By means of Chow tests, we checked the stability of the estimated equation, and found a high degree of instability in the parameters. In other words, it will not be correct to explain the variations of the confidence in the same manner today as during the eighties. For the sake of brevity results are not reported here.

We then decided to cut the sample in two parts and search for a cointegrating relationship on each subsample. The first part covers the period from 1983 to 1990, while the other one covers the period from 1992 to 2001. We did find cointegration between the consumer confidence index and economic variables in both subsamples (see sections 3.2 and 3.3). Unfortunately, the variables do not exhibit the same statistical properties in both subsamples. For instance, the ISM index is integrated of order 1 during the eighties, but stationary during the nineties. This implies that we do not have the same transformation of the variables in the cointegration relationship in both subsamples.

The choice of these two sub-periods was driven by the instability tests on the ADL model for the full sample, but can be explained by economic reasons as well. Indeed, both periods differ in terms of the conduct of monetary policy and the economic environment. Moreover, financial

[10] we could have considered the first difference of the series, but from an economic point of view the yearly growth rate is more meaningful.

innovation accelerated at the end of the eighties while the growing participation of households in stock market took really place in the nineties. Finally, during the nineties the emergence of information technologies as well as the exuberant rising of stock prices from 1994-5 onwards have increased the importance of stock markets in the portfolio of most households.

Once more we will not develop results for Belgium as much as for the United States, as it is mainly treated to analyze the stock market impact. We selected the same variables (or equivalent) as for the USA. For Belgium, the confidence survey (csurv) and the business cycle survey (for homogeneity, we also denote it by ism) as well come from the Belgostat database of the National Bank of Belgium. The other data for Belgium were downloaded from Thomson Financial Datastream database, i.e. the real stock price index (spr), that is the total market index published by Thomson Financial Datastream[11] deflated by the consumption price index, wages in real terms (salr), and the long-term yield (yield), that is the 20year yield on the linear bonds or its equivalent during the eighties. The data spans from 1984.1 to 2001.12.

We then performed the same analysis as with the United States, but similar results arose: no cointegration for the whole sample, and a strong instability in the ADL model. We then decided to cut the sample as for the American economy.

3.2 The eighties: the ISM is driving consumer confidence evolutions

The first sub-period ranges from 1983.1 to 1990.12 for each country. For the United States, we obtain the following cointegrating equation:

$$\begin{array}{rcccc} d12mich & = & -85.52 & + & 1.67 \quad ISM \\ & & (10.55) & & (0.20) \end{array} \tag{3}$$

Note that the ISM is not stationary during this period, contrary to the whole sample. It is however interesting to underline that no cointegration was found when using the level of the consumer confidence. The complete error-correction mechanism (ECM) equation is reproduced in table 4, with some misspecifications tests in table 5.

During the eighties, economic variables of business cycle (such as growth indicator) seem to

[11] As the BEL20 was created in 1991 we did not use it.

be the main forces that have driven the confidence index: consumer confidence is cointegrated with the business cycle indicator. In the short term equation, the ISM is still very important and its coefficients sum to 1.5. There is no monetary illusion, as consumer expectations about inflation tend to depress consumer confidence; this is consistent with a period of high inflation. Note also that the stock markets index is not present in the final ECM model displayed in table 4, as its coefficients were not significant.

Insert table 4 about here

Insert table 5 about here

Regarding Belgian data, the results are pretty close. The data spans the period from 1984.1 to 1989.12. The long-term stock markets coefficient is positive and significant, but it is clearly a proxy for the business cycle: when removed from the equation, the business cycle indicator coefficient rises sharply, whereas the residual variance does not change.[12]

$$\begin{array}{l} d12csurv = \underset{}{0.05809} \underset{(0.01465)}{+0.05265 d12spr} \underset{(0.02852)}{+0.9342 d12salr} \underset{(0.7369)}{} \\ +0.1518 d12\_20yield \underset{(0.04231)}{} +0.003437 ISM \underset{(0.001662)}{} \end{array} \tag{4}$$

3.3 The nineties: stock markets, a new studied variable for households

The most striking point for our analysis is that the cointegrating relationship changes dramatically in the beginning of the nineties. This equation becomes for the US confidence index:

$$\begin{array}{lllllllll} mich & = & 129.1 & - & 7.10 & unemp & + & 0.17 & d12spr & + & 0.83 & d12salr \\ & & (2.96) & & (0.43) & & & (0.03) & & & 0.39 & \end{array} \tag{5}$$

The ISM is not anymore the only long term driver of the consumer confidence evolution. Let's note immediately that the ISM does not enter the long-term equation because the variable is stationary during the estimation period. Furthermore, no cointegration relationship was found

[12]The same misspecifications tests as in table 5 were performed, and all tests were passed.

with the level of real stock indexes and real salary. One explanation for that is that several studies (e.g. European Commission, 2001) show that the consumer confidence is a proxy for consumption *growth*, not level.

During the nineties, three variables appear in the long-term equation, all with the expected sign. The first one is the unemployment rate. This is pretty surprising as the USA passed through a period of continuously decreasing unemployment during the nineties. The second variable is real labor income growth: an increase by 1 point improves consumer sentiment by 0.83 points. Finally, stock market growth appears with a positive coefficient.

In the short run (see table 6, and table 7 for the tests), stock market growth still influences positively consumer confidence. The other short-term variables are expected inflation, short-term interest rates (both with negative signs) and the business cycle indicator (with positive signs). The expected inflation coefficient is significant at a 10% level only; this is consistent with a low-inflation period.

Insert table 6 about here

Insert table 7 about here

These results broadly support the intuition among financial analysts that stock prices fluctuations influence consumer confidence. As stated in the beginning of this paper, this could be explained by a wealth effect or a proxy effect. To give some hints on which effect predominates, we estimated the same equation on Belgian data. As no cointegration relation was found, we simply estimated an ADL model on the yearly growth rate. The estimate results are[13] :

$$\begin{aligned} d12csurv = \; & -0.05465 \; -0.3057 d12unemp \; +7.968 d12salr \\ & \quad (0.03874) \qquad (0.3803) \qquad (3.941) \\ & +1.59 d12ISM \\ & \quad (0.7029) \end{aligned} \tag{6}$$

As explained, Belgians households do not invest in stock markets as much as Americans (see tables 12 and 13), so that a wealth effect should not be at hand. Still, Belgian households

[13]The same misspecifications tests as in table 7 were performed, and all tests were accepted. They are available upon request

could be sensitive to stock markets when assessing their expectations. The estimations show that stock markets do not influence consumer confidence in Belgium. This supports the idea that a wealth effect is at hand in the United States. Obviously, we would need micro-data on consumers responses to the survey and the respondents wealth characteristics to be able to distinguish properly the wealth effect from the proxy effect.

4 A closer look at the structural change

To analyze closely the instability of our equations we decided to estimate Bayesian non linear models. The main advantage of this method is that, by opposition to the previous methodology, the estimate will tell us where the break point is, and if the structural change is abrupt or smooth: we do not have to choose arbitrarily the break point. This is very useful in cases as ours, when the instability tests detect several potential breakpoints.

The only drawback of this method is that it is still not well-developed for non-stationary data. We cannot conduct the cointegration analysis in two sub periods, as it has been done in the previous section. We therefore decided to work with differentiated (thus stationary) variables. The model estimated is an ADL one as defined in equation 1.

4.1 Non linear modelling: methodology

Typically when estimating a regression model, we assume that the conditional expectation is linear, i.e.

$$E(y_t|x_t) = x_t^{'}\beta \tag{7}$$

But, it is widely known that economic data are subject to changes in regimes, depending for example on the state of the business cycle. Therefore, we could assume that the conditional expectation of the endogenous variable depends on the regime:

$$E(y_t|x_t) = x_t^{'}\beta_1 \tag{8}$$

in regime 1, and

$$E(y_t|x_t) = x_t^{'}\beta_2 \tag{9}$$

in regime 2. The move from one to another regime is driven by a transition function $F(\widetilde{z}_t'\theta)$. The variable $\widetilde{z}_t$ is called the switching variable. The general model can be written:

$$y_t = [1 - F(\widetilde{z}_t'\theta)]\, x_{1t}'\beta_1 + F(\widetilde{z}_t'\theta)x_{2t}'\beta_2 + \epsilon_t \tag{10}$$

Thus the model is linear in the parameters conditionally on θ.

In threshold regression models, the switching depends on a *threshold* value. Assume $\widetilde{z}_t = (z_t, 1)$. Therefore:

$$\widetilde{z}_t'\theta = z_t\theta_1 + \theta_2 = \theta_1(z_t + \frac{\theta_2}{\theta_1}) = \gamma(z_t - c) \tag{11}$$

γ described the smoothness of the transition, and c is called the threshold parameter.

4.2 Typology of non linear models

To define the type of threshold models we are using, we need to precise two more things:

1. The shape of the transition function $F(.)$. If the change between the two regimes is abrupt, we will consider a step function (e.g. dirac function). Otherwise, we can consider a cumulative distribution function (cdf) to model a smooth transition (e.g. a logistic distribution). Another possibility is to consider that the change is random, and then to model $F(.)$ by Markov chains[14].

2. the switching variable $\widetilde{z}_t$. We can consider a time index (structural break) or a continuous variable.

The choice between these different models is far from obvious. The ideal case is when there exists some economic intuition that helps defining z or F. Fortunately, several statistical procedures can be applied. A nice approach is the one developed by Granger and Terasvirta (1993);

1. Choose a linear model (e.g. use AIC, SBIC criteria).

2. Estimate

$$y_t = x_t'\beta_1 + x_t'z_t\beta_2 + x_t'z_t^2\beta_3 + x_t'z_t^3\beta_4 + \epsilon_t \tag{12}$$

[14]We will not consider this case in the present work. For an introduction to Markov switching models, see Hamilton (1994, Chap. 22).

3. Test $H_0 : \beta_2 = \beta_3 = \beta_4 = 0$ (i.e. we test if the model is linear).

4. Choose the model with the smallest p-value or SBIC.

An interesting feature of this method is that we do not need to estimate a non linear model to decide if it better fits the data.

4.3 Bayesian analysis of Threshold regression models

In a classical estimation framework, estimating a threshold regression models is troublesome. First, the likelihood of the threshold parameter is ill-behaved (see Bauwens, Lubrano, and Richard (1999, Chap. 8), for a developed argumentation). Besides, classical econometricians have to decide *a priori* if the change is smooth or abrupt. Bayesian econometrics naturally solve these two limitations. First, in a Bayesian framework, no condition on the likelihood function is needed to estimate posterior densities and moments. Regarding the second problem, we do not estimate only the expectation of the threshold parameter, but the full (posterior) density. We can therefore analyze the smoothness of the transition, even by dealing with a step transition function [15].

As explained before, a nice feature of threshold regression models is that they are linear conditionally on θ. This simplifies a lot the Bayesian estimation: we can use the natural conjugate framework for the linear part. Then, by numerical integration we compute marginal moments. Recall that the model can be written:

$$y_t = x_t'(\theta)\beta + \epsilon_t \tag{13}$$

Then, assuming normality, the likelihood function is:

$$L(\beta, \sigma^2, \theta; y) \propto \sigma^{-T} \exp\left[-\frac{1}{2\sigma^2}\sum_{t=1}^{T}(y_t - x_t'(\theta)\beta)^2\right] \tag{14}$$

Conditionally on θ, we are back to the linear regression framework developed in Bauwens, Lubrano, and Richard (1999, Chap. 2). We therefore define the prior density using the natural

[15] This probably explains why smooth transition models (STR) are widely developed in a classical framework, even if they require the estimation of *two* parameters with ill-behaved likelihood, instead of one in the sharp transition model.

conjugate framework:

$$\varphi(\beta, \sigma^2, \theta) = \varphi(\beta, \sigma^2)\varphi(\theta) \tag{15}$$

and the prior on β and σ^2 is normal-inverted gamma 2:

$$\varphi(\beta|\sigma^2) = f_N(\beta|\beta_0, \sigma^2 M_0) \tag{16}$$

$$\varphi(\sigma^2) = f_{IG}(\sigma^2|\upsilon_0, s_0) \tag{17}$$

The posterior densities are:

$$\varphi(\beta|\theta, y) = f_t(\beta|\beta_*(\theta), s_*(\theta), M_*(\theta), \upsilon_*) \tag{18}$$

$$\varphi(\sigma^2|\theta, y) = f_{IG}(\sigma^2|\upsilon_*, s_*(\theta)) \tag{19}$$

with the parameters defined as in Bauwens, Lubrano, and Richard (1999).

We can then define the posterior density of θ:

$$\varphi(\theta|y) \propto |s_*(\theta)|^{-\upsilon_*/2}|M_*(\theta)|^{-1/2}\varphi(\theta) \tag{20}$$

To compute the posterior moments, we have to integrate the posterior densities with respect to θ. As θ is typically of low dimension, Simpson's rules can be readily applied by using the following well-known formula:

$$E(\beta|y) = E_{\theta|y}\left[E(\beta|\theta, y)\right] \tag{21}$$

$$E(\beta|\theta, y) = \beta_*(\theta) \tag{22}$$

When the threshold parameter is discrete (e.g. time index), integration with respect to θ amounts to:

$$E(\beta|\theta, y) = \sum \beta_*(\theta)\varphi(\theta|y) = \frac{\sum \beta_*(\theta)\kappa(\theta|y)}{\sum \kappa(\theta|y)} \tag{23}$$

where κ indicates the kernel of the density φ. The same argument can be applied for the error variance:

$$E(\sigma^2|y) = E_{\theta|y}\left[E(\sigma^2|\theta, y)\right] \tag{24}$$

$$E(\sigma^2|\theta, y) = \frac{s_*(\theta)}{\upsilon_* - 2} \tag{25}$$

4.4 Results

We first fit a linear model on the data. We estimated models with 13 lags on both the endogenous and exogenous variables. We kept the same set of exogenous variables as in the previous section, i.e. dspr, dsalr, dfedf, ISM, dunemp, dexcpi.

By means of F-tests we removed useless lags. We finally kept 13 lags on the endogenous and 6 on the exogenous variables.

4.4.1 Non linearity tests

Based on economic intuition, we consider 3 possible switching variables:

- time: in that case we test if there is a structural break in the linear model.
- lagged endogenous: if true, this would imply that the non linearity comes from asymmetries with respect to the business cycle.
- stock markets: if true, this would imply that the non linearity comes from asymmetries with respect to stock markets evolutions.

Furthermore, we consider 4 possible groups of variables with a change in their coefficients: all exogenous variable, only stock markets, only expected inflation and both expected inflation and stock markets. We decided to test if the expected inflation coefficient changed as there was a strong change in monetary policy during the period under review.

The results of the tests are in table 8. Note that to keep enough degrees of freedom we did not had the term $x_t' z_t^3 \beta_4$ as described in section 4.2, but only the squared term. As this is a very poor Taylor approximation to a non linear structure, the tests are not so reliable.

Insert table 8 about here

Two features are striking in table 8. First, nearly all F-tests support the structural change hypothesis. Second, for some lags of the consumer sentiment variable, the tests indicate that there is potentially an asymmetry of the linear equation with respect to the business cycle.

4.4.2 Structural break

We do not have any prior information about the parameters and the shape of the prior distribution; so we choose a non-informative prior. The Bayesian estimates (see table 9) show that there is structural change at the end of the eighties, consistently with what we observed when we decided to cut the sample. The change is rather quick (the expected break point is 1988.12, with a standard deviation of roughly three months).

Insert table 9 about here

We immediately see that the stock market coefficient strongly changes: from negative, it becomes positive during the second regime. During the eighties, an increase in the stock market prices pushed the households to increase their savings, which seems to be consistent with the observations in Starr-McCluer (2002). In the most recent years, this dynamic was inverted: a rise in stock market prices leads households to increase their confidence.

Another variable sign changes according to the regime: expected inflation. Inflation was high during most part of the eighties, it is therefore likely that households incorporated potential inflation losses in their income expectations, and therefore in the consumer confidence index. With inflation becoming low during the nineties, inflation expectation were not as crucial as before and some kind of monetary illusion could have even arisen (which could explain the positive sign). Anyway, the coefficient for the second period is not significant, consistently with a low-inflation period. This result could be interpreted as a credibility factor of the monetary policy. Since the second part of the eighties, the commitment of monetary authorities in hot regimes to fight inflation seems to be believed by household, so that this commitment has reduced inflation expectations. In some sense, it works as the inflation become a smaller problem from the households'viewpoint. The other variables coefficient are pretty stable between both periods.

We also estimated these equations on the 5 questions that are summed up in the consumer sentiment. Some interesting results arose when we estimated the future financial (1 year ahead) and economic (5 years ahead) conditions questions (see tables 10 and 11).

Insert table 10 about here

Insert table 11 about here

During the nineties, stock markets do indeed influence expectations on financial conditions, but not economic expectations. That supports the idea that the influence of stock markets on consumer sentiment comes from the structure of Americans' wealth, and confirms the intuition arising from the comparison with the Belgian estimates. Furthermore, the break point model estimate for financial expectation is much later than for the overall index or for the economic expectation question: 1994.12 rather than 88.12 and 89.09 respectively. This breakpoint corresponds to the beginning of the stock markets bubble. This result is quite important and may thus suggest that the importance of equities in explaining the households behavior is recent. We should notice that this change occurred when the speculative bubble began. This may imply that with the comeback to more normal growth rates, stock markets may not be anymore a determinant of consumer confidence in the future years.

We will not present here results with a structural break on part of the exogenous variables only (stock markets and/or expected inflation), as the results are qualitatively the same.

4.4.3 Business cycle asymmetries

We also tested if the instability in the full sample equation could be due to asymmetries in the business cycle, i.e. the impact of the economic variables on the consumer confidence is different when we are in a recession or an expansion period. The tests show that there could be such asymmetries. The presence of such asymmetries could be explained for instance by the fact that the confidence of households may be more influence by the frame of mind (or self-fulling prophecies) in some periods. For example, during a boom, the general feeling that things are going well may reduce the impact of economic variables on the confidence. On the other hand, during a recession or an economic slowdown, households may attach more importance to economic variables for determining their confidence in order to confirm (or to lift) the surrounding pessimism. In that case, the link between the consumer confidence and the economic variables would be stronger. Another possibility would be to link the business cycle asymmetries to the ones we may observe in the transmission mechanism of monetary policy for which the response of economic variables to monetary policy decisions is stronger during a recession (Peersman and Smets, 2001). Nevertheless, in our case, the estimated coefficients were not significant so we conclude there are no business cycle asymmetries.

Concerning asymmetries with respect to the stock market cycle, the estimate was not conclusive as most of the coefficients were non significant.

5 Conclusion

Taking into account the growing role of the consumer confidence in the forecasting models of real consumption, the paper proposes to analyze in more details the parameters driving its evolution. In particular, besides the traditional economic variables for which explicit questions are present in the survey (employment, wages, business cycle, etc.), we study to what extent the consumer confidence may be influenced by other variables as well. On this point, we especially think of the role of stock markets. Several elements have motivated this choice, among others the growing accessibility of financial news, the financial innovation, explicit measures to rise individuals participation in the equity investments, and so on. Up to now few studies tend to capture the factors behind the evolution of the consumer confidence while its importance in the business cycle analysis is now well recognized. The advantage of using the confidence indicator is that it allows to capture both potential influences of stock markets on households behavior: the standard wealth effect and what we call the proxy effect (of the future business cycle).

Our results show first that the parameters driving the consumer confidence are changing over time. Second, the influence of stock price fluctuations modifies and rises over time as well. Having broadly the same information as the activity indicator during the eighties, stock market fluctuations become an important factor during the nineties along with the other economic variables in the United States. However, similar results cannot be claimed for Belgium. Given the different penetration of stocks in households wealth, the results for the United States may be explained mostly by a growing importance of the wealth effect channel.

Finally, the non linear model estimations suggest that this growing influence of equities on the consumer confidence index was abrupt while no specific asymmetries were detected with respect to the business cycle. Moreover, given the fact that the significant influence of equity fluctuations on the expected financial situation in the United States seems to be quite recent, that may suggest that the actual picture we have of the wealth effect could be underestimated and thus significant changes on this point are still operating.

The next natural step will be to confirm these results by estimating the same models on

micro data, to link each single households to its consumer surveys answers. Another promising area of research would be to reestimate the consumption function. It is typically estimated on long periods. Our results suggest that the relationships may not be stable, what seems to be captured by the non linear models.

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Table 1: Correlation coefficients between economic sentiment and economic real variables

	1979-2001	1979-1989	1990-2001	1995-2001
mich/d12cons	0.72	0.76	0.74	0.76
cfb/d12cons	0.56	0.54	0.66	0.78
d12mich/d12salr	0.29	0.46	0.19	0.03
d12mich/ism	0.56	0.49	0.76	0.80
d12mich/d12l	0.22	0.03	0.52	0.82
d12mich/d12unemp	-0.29	-0.14	-0.53	-0.73
d12mich/d12fedf	0.08	-0.12	0.31	0.44
d12mich/d12_10yield	0.09	-0.05	0.28	0.47
d12mich/d12spr	0.45	0.46	0.48	0.74
d12mich/π	-0.20	-0.27	-0.43	-0.11

Source : Thomson Financial Datastream; Authors' calculations.
Note : *mich* denotes the consumer confidence index of Michigan, *cons* denotes the annual growth of real consumption, *cfb* is the consumer confidence index of Conference Board, *salr* is the hourly wages in real terms, the ISM index is the industrial activity index of the Institute of Supply Management (i.e. the ex-NAPM index of the National Association of Purchasing Management), l is the employment level, *unemp* is the unemployment rate, *fedf* and *10yield* are respectively the short- and long-term interest rates, *spr* denotes the real value of the S&P 500 stock index, and π denotes the annual inflation rate.
d12 indicates that the variable is in yearly growth rate.

Table 2: Percentage of Assets Owned by Several Category of Households

% of Owners	1	2	3	4
Top .5	41.4	37.0	24.2	10.2
Next .5	11.8	10.7	7.8	4.6
Next 4	27.7	27.2	26.2	20.5
Next 5	10.3	11.3	14.0	15.4
Next 10	7.2	9.8	13.9	20.1
Bottom 80	1.7	4.1	14.0	29.3

Source : Poterba's tabulations using 1998 Survey of Consumer Finances available in Poterba (2000). Column 1 includes common stocks excluding pensions; Column 2 includes all common stocks; Column 3 includes non equity financial assets and column 4 includes Housing equities.

Table 3: Correlation with the yearly change growth in the US industrial production (in real terms)

Periods	SPR index	ISM
1970-2001	0.60	0.80
1970-1979	0.83	0.80
1980-1989	0.62	0.89
1990-1999	0.37	0.72
2000-2001	0.88	0.87
1995-1999	0.04	0.74

Note : SPR index is the yearly change of the Standard and Poor's 500 price index deflated by the cpi while ISM denotes the level of the ISM index.

Table 4: ECM estimates, 1983-1990.

Variable	Estimated Coefficient	Standard Error	t-statistic	P-value
C	-0.055179	0.448309	-0.123082	[.902]
D1ISM(-1)	0.518451	0.120351	4.30784	[.000]
D1ISM(-2)	0.283210	0.108367	2.61345	[.011]
D1ISM(-5)	0.357823	0.111614	3.20588	[.002]
D1UNEMP(-3)	0.403061	0.174660	2.30769	[.023]
D1EXCPI	-0.092534	0.042746	-2.16473	[.033]
D1EXCPI(-1)	-0.152396	0.043165	-3.53057	[.001]
D1FEDF(-3)	0.068357	0.042458	1.60999	[.111]
ECM(-1)	-0.082933	0.043215	-1.91909	[.058]
DD12MICH(-4)	-0.300248	0.091412	-3.28456	[.001]

Dependent variable: DD12MICH, Current sample: 1983:2 to 1990:12. Number of observations: 95. Adjusted R-squared = 0.381708. ECM denotes the residual of equation 3.
D1 denotes the first difference, D12 the yoy growth rate, and DD12 the first difference of a yoy growth rate.

Table 5: Mispecification tests statistics, 1983-1990

Durbin's h alt. =	0.180072	[.857]
Ljung-Box Q-statistic14 =	17.6918	[.221]
Ljung-Box Q-statistic15 =	17.6967	[.279]
CuSum test =	0.505883	[.627]
CuSumSq test =	0.134436	[.292]
White het. test =	44.7160	[.812]
Jarque-Bera test =	3.78213	[.151]
F(56,69) Test Statistic:	1.22	[.210]

The F-statistic tests if the restricted model as displayed in table 4 is an appropriate restriction of the model with all the lags included.

Table 6: ECM estimates: 1992-2001.

Variable	Estimated Coefficient	Standard Error	t-statistic	P-value
C	-23.2194	3.59350	-6.46150	[.000]
ISM	0.453029	0.069266	6.54041	[.000]
DD12SPR	0.166580	0.043462	3.83280	[.000]
DD12EXCPI(-6)	-0.024437	.014878	-1.64244	[.103]
DD12FEDF(-3)	-0.787209E-03	.321376E-03	-2.44950	[.016]
DD12FEDF(-4)	-0.100632E-02	.428687E-03	-2.34744	[.021]
DD12FEDF(-5)	-0.121573E-02	.377292E-03	-3.22225	[.002]
ECM(-1)	-0.489228	0.066664	-7.33873	[.000]
DMICH(-11)	-0.143485	0.066721	-2.15051	[.034]

Dependent variable: DMICH, Current sample: 1992:2 to 2001:12, Number of observations: 119, Adjusted R-squared = .409937.ECM denotes the residual of equation 5.
D1 denotes the first difference, D12 the yoy growth rate, and DD12 the first difference of a yoy growth rate.

Table 7: Mispecification tests statistics, 1992-2001

LM het. test =	0.311540	[.577]
Durbin's h alt. =	0.358228	[.720]
CuSum test =	0.872687	[.086]
CuSumSq test =	0.079340	[.797]
Chow test =	1.04200	[.412]
White het. test =	42.2418	[.547]
Jarque-Bera test =	0.340013	[.844]
F(48,99) Test Statistic:	0.71	[.902]

The F-statistic tests if the restricted model as displayed in table 6 is an appropriate restriction of the model with all the lags included.

Table 8: Non linearity tests, 1981.02-2001.12

z_t	time		y_{t-1}		y_{t-2}	
	SBIC	F-test	SBIC	F-test	SBIC	F-test
exogenous	-6.6075	0.0012	-6.6411	0.0013	-6.4756	0.0298
stock markets	-8.2538	0.0639	-8.1578	0.8686	-8.1974	0.4416
exp. inflation	-8.3187	0.0027	-8.2418	0.1044	-8.2060	0.3515
exp.infl+stock m.	-7.9405	0.0007	-7.8056	0.0977	-7.7470	0.3801
z_t	y_{t-3}		y_{t-4}		y_{t-5}	
	SBIC	F-test	SBIC	F-test	SBIC	F-test
exogenous	-6.7413	0.0001	-6.8673	0.0000	-6.7225	0.0002
stock markets	-8.2155	0.2649	-8.2173	0.2506	-8.2603	0.0484
exp. inflation	-8.2531	0.0660	-8.3056	0.0054	-8.2293	0.1668
exp.infl+stock m.	-7.7788	0.1952	-7.8535	0.0219	-7.8112	0.0835
z_t	y_{t-6}		y_{t-12}		$dspr_{t-2}$	
	SBIC	F-test	SBIC	F-test	SBIC	F-test
exogenous	-6.5994	0.0030	-6.3681	0.1409	-6.5520	0.0077
stock markets	-8.2521	0.0687	-8.2032	0.3801	-8.2131	0.2856
exp. inflation	-8.2315	0.1539	-8.1971	0.4452	-8.1850	0.5844
exp.infl+stock m.	-7.8359	0.0393	-7.7471	0.3790	-7.7538	0.3342

Dependent variable: D12MICH, Current sample: 1981:2 to 2001:12, Number of observations: 251, Adjusted R-squared =.88. Estimated equation: cf. equation 12. Exogenous variables (x_t): dspr, dsalr, dfedf, ISM, dunemp, dexcpi.. 13 lags on the endogenous, 6 on the exogenous variables.

Table 9: Bayesian estimate of the ADL model, Consumer confidence

First period	Variable	Estimated Coefficient	Standard Error
	d12spr	-0.61779	0.330314
	d12salr	0.689866	1.667253
	d12fedf	0.005893	0.002985
	ism	0.020763	0.014856
	d12unemp	0.179011	0.447220
	d12excpi	-0.65100	0.419888
Second period	d12spr	0.272096	0.145857
	d12salr	0.518419	1.106.825
	d12fedf	0.006431	0.005665
	ism	0.023392	0.014717
	d12unemp	0.503323	0.214480
	d12excpi	0.083247	0.111632

The estimated model is an ADL one (equation 1, with a structural break ($z_t = \tau$, the time index). The coefficients in the table are the long-term ones, computed by means of the ADL estimate (equation 2).
E(σ^2|d12mich) = 0.00089. SBIC (Schwarz) = 0.969. E(τ|dmich) = 88.13. Sd(τ|d12mich) - in months = 4.13 i.e. 0.345 years. Mode(τ|d12mich) = 88.12. Prob(mode of τ|d12mich) = 0.42

Table 10: Bayesian estimate of the ADL model, Expectations about future financial conditions

First period	Variable	Estimated Coefficient	Standard Error
	d12spr	-0.26021	0.124039
	d12salr	-0.50777	0.765808
	d12fedf	0.000184	0.001046
	ism	0.008087	0.004069
	d12unemp	-0.05193	0.141071
	d12excpi	-0.34078	0.152634
second period	d12spr	0.282134	0.174619
	d12salr	-0.39044	0.970860
	d12fedf	0.069954	0.083294
	ism	0.000812	0.002643
	d12unemp	0.683723	0.326607
	d12excpi	-0.02757	0.129999

The estimated model is an ADL one (equation 1, with a structural break ($z_t = \tau$, the time index). The coefficients in the table are the long-term ones, computed by means of the ADL estimate (equation 2).
E(σ^2|d12mich) = 0.00064. SBIC (Schwarz) = 0.641. E(τ|d12mich) =94.12. Sd(τ|d12mich) - in months = 0.095. Mode(τ|d12mich) = 94.12. Prob(mode of τ|d12mich) = 0.99

Table 11: Bayesian estimate of the ADL model, Expectations about future economic conditions, 5 years ahead)

First period	Variable	Estimated Coefficient	Standard Error
	d12spr	-0.64867	0.312662
	d12salr	3.978616	2.086660
	d12fedf	0.001333	0.002105
	ism	0.029887	0.014396
	d12unemp	1.36613	0.661065
	d12excpi	-0.18404	0.214496
second period	d12spr	-0.10363	0.131356
	d12salr	2.411223	1.207918
	d12fedf	-0.00555	0.006086
	ism	0.015554	0.005334
	d12unemp	-0.10575	0.249787
	d12excpi	0.063715	0.113781

The estimated model is an ADL one (equation 1, with a structural break ($z_t = \tau$, the time index). The coefficients in the table are the long-term ones, computed by means of the ADL estimate (equation 2).
E(σ^2|d12mich) = 0.0044. SBIC (Schwarz) = 2.56. E(τ|d12mich) =89.08. Sd(τ|d12mich) - in months = 6.25 i.i. 0.52 years. Mode(τ|d12mich) = 89.09. Prob(mode of τ|d12mich) = 0.312

Table 12: Structure of the financial wealth of households in the United States (% in nominal terms)

Assets	1992	1995	2000
Deposits	18.7	15.3	13.2
Fixed Income	9.8	8.9	6.3
Listed Stocks	20.8	24.6	31.2
Mutual Funds	27.9	30.0	30.2
Other	22.8	21.2	19.1
Total	100	100	100

Source : Board of Governors of the Federal Reserve

Table 13: Structure of the financial wealth of households in Belgium (% in nominal terms)

Assets	1992	1995	2000
Deposits	28.7	28.9	25.4
Fixed Income	33.7	29.9	20.9
Listed Stocks	4.9	5.1	10.7
Mutual Funds	6.5	8.8	14.8
Other	26.2	27.3	28.2
Total	100	100	100

Source : National Bank of Belgium

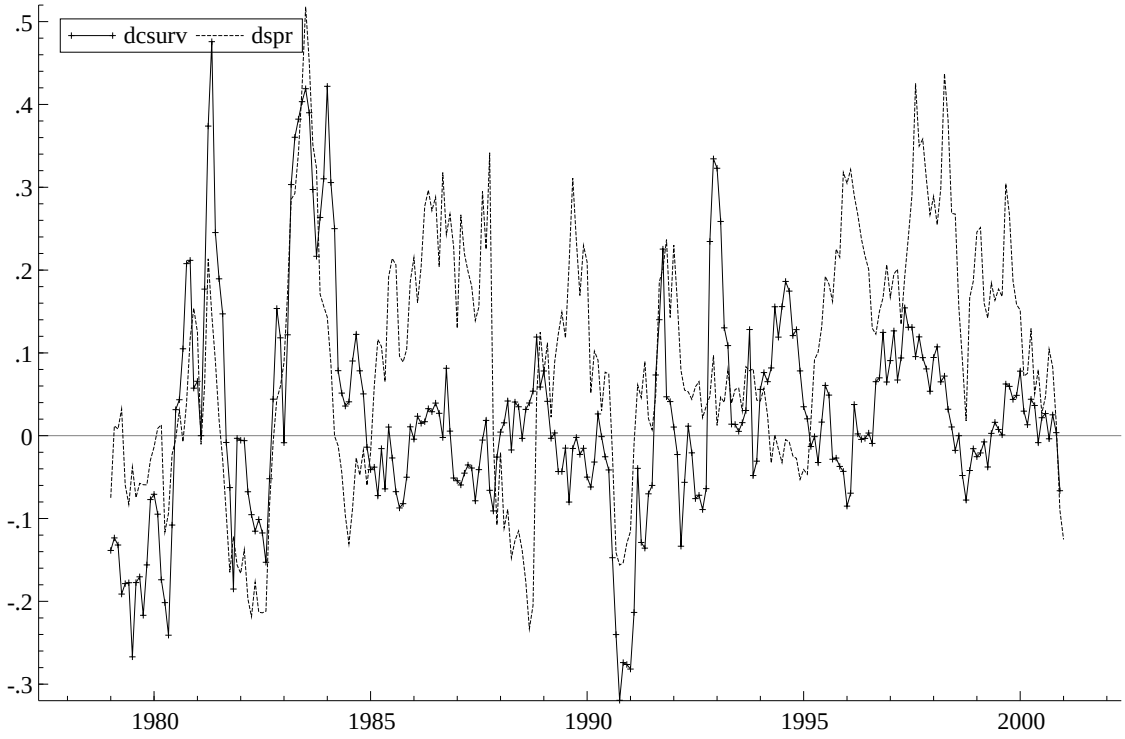
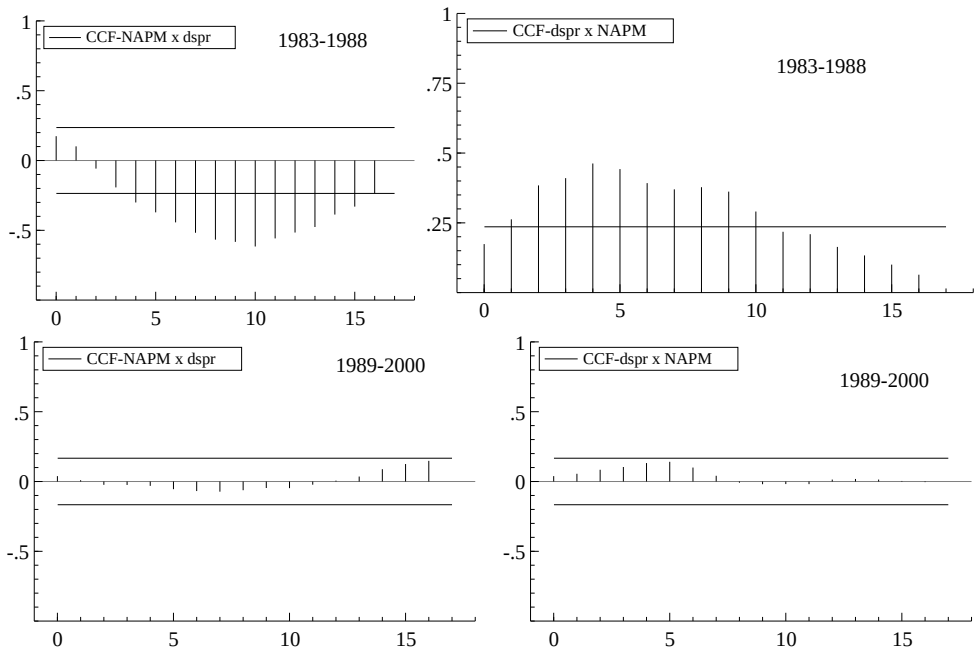


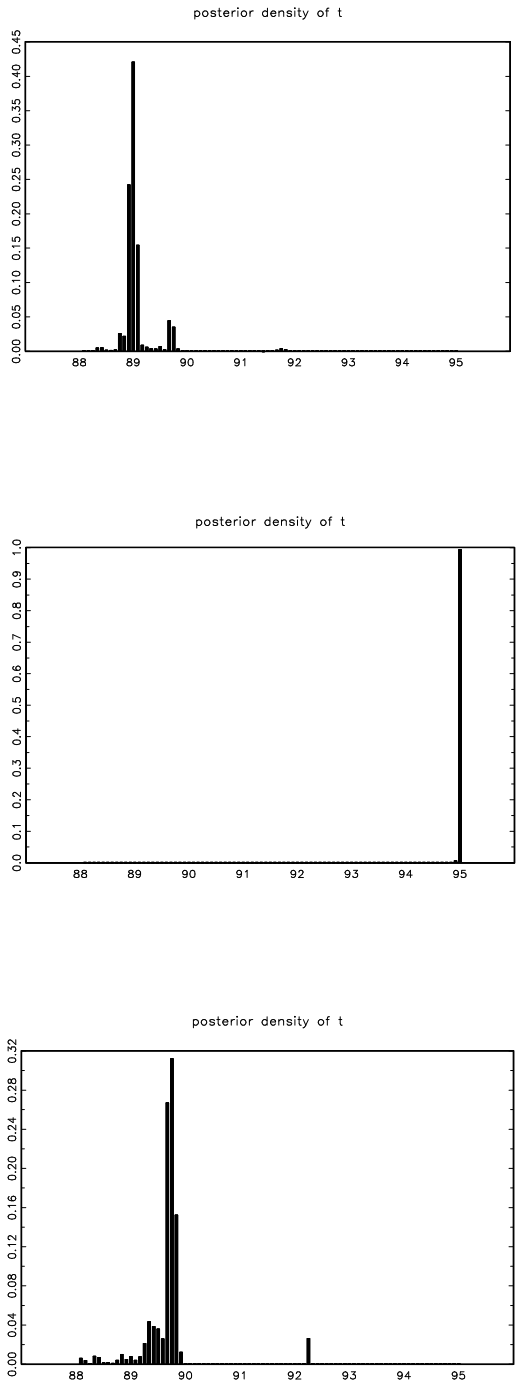
Figure 1: Compared evolutions of yoy Michigan consumer index and S&P500.

Figure 2: Contemporaneous and lagged correlation between the ISM and S&P500 yoy rate



The graphs display the correlation between one variable and the contemporaneous and lagged second variable, for two periods (1983-1988 and 1989-2000). The graph in the right upper corner corresponds to the correlation between the stock market yearly real growth, and contemporaneous (lag=0) to 16 lags of the napm. The other three graphs are done in a similar way. As variables are monthly, one lag corresponds to one month.

Figure 3: Probability to observe a structural break at several points in time (from 1988.1 to 1994.12)



The graphs display the possible periods for the structural break and the corresponding probability to observe a break at that period, for the three endogenous variables:d12mich (top), d12sitfinp12 (middle), and d12sitecop12 (bottom).