PRACE NAUKOWE
Uniwersytetu Ekonomicznego we Wrocławiu

RESEARCH PAPERS
of Wrocław University of Economics

Nr 451

Finanse publiczne

Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu
Wrocław 2016

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Wrocław 2016

ISSN 1899-319
e-ISSN 2392-0041

ISBN 978-83-7695-618-3

Wersja pierwotna: publikacja drukowana

Zamówienia na opublikowane prace należy składać na adres:
Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu
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Druk i oprawa: TOTEM

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Wstęp

Publikacja *Finanse publiczne* została wydana w ramach Prac Naukowych Uniwersytetu Ekonomicznego we Wrocławiu. Poszczególne jej części stanowią dorobek pracowników naukowych najbardziej liczących się w Polsce ośrodków naukowych. Przedstawione opracowania odnoszą się do całego spektrum problemów naukowo-badawczych związanych z finansami publicznymi i polityką fiskalną. Poszczególni autorzy prezentują wyniki swoich badań teoretycznych i empirycznych w zakresie zarządzania dochodami i wydatkami budżetu centralnego oraz budżetów jednostek samorządu terytorialnego, w kontekście zarówno reformy finansów publicznych, reformy systemu emerytalnego, pomocy publicznej, jak i teoretycznych podstaw realizacji wyznaczonych celów przez narzędzia polityki fiskalnej.

Niniejsza publikacja jest adresowana do środowisk naukowych i studentów wyższych uczelni oraz osób, które w praktyce gospodarczej mają styczność ze stroną dochodową lub wydatkową polityki fiskalnej.

Poszczególne fragmenty książki były recenzowane przez profesorów uniwersytetów, w większości kierowników katedr finansów, katedr ekonomii oraz polityki ekonomicznej, którym chciałbym podziękować za rzetelne recenzje. Składam również wyrazy uznania pracownikom Katedry Ekonomii i Polityki Ekonomicznej Uniwersytetu Ekonomicznego we Wrocławiu oraz pracownikom Wydawnictwa za wiele wysiłku i zaangażowanie, dzięki któremu powstała ta publikacja.

Mam głębokie przekonanie, że książka *Finanse publiczne*, którą oddajemy w Państwa ręce, będzie inspiracją do dalszych badań i dociekań naukowych oraz do powstania równie inspirujących opracowań w przyszłości.

Jerzy Sokołowski

PRACE NAUKOWE UNIWERSYTETU EKONOMICZNEGO WE WROCŁAWIU
RESEARCH PAPERS OF WROCŁAW UNIVERSITY OF ECONOMICS nr 451 • 2016

Finanse publiczne

ISSN 1899-3192
e-ISSN 2392-0041

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ATP-PENSION FUND'S INVESTMENTS AND CONSUMPTION IN SWEDEN 1961–1994. PAST EXAMPLE, BUT PROBLEM STILL NOT RESOLVED

INWESTYCJE FUNDUSZY EMERYTALNYCH ATP A KONSUMPCJA W SZWECJI (1961–1994). MINIONY PRZYPADEK, LECZ PROBLEM WCIĄŻ AKTUALNY

DOI: 10.15611/pn.2016.451.03
JEL Classification: E21, H55

Summary: Sweden at the beginning of the 1990s was overtaken by the financial and housing market crisis. Economists claim that Swedish example is similar to the 2008 global financial crisis. It is also postulated that aberrant consumption pattern was observed in Sweden in the late 1980's. In this research I investigate the impact of the ATP-pension funds investment on the consumption in Sweden over the period since its creation to the Swedish financial crisis (1961–1994). The analysis is divided in two steps: in the first one pure consumption model is augmented by the ATP pension funds investment. ATP investments are assigned to three groups: Swedish Company Shares, Government Bonds and Housing Market Securities. The second goal is to find the *true determinants* of the consumption. Using Bayesian inference I show that pension funds investment in the housing market assets spurs excess consumption, so decrease net savings.

Keywords: Pension funds, consumption, investments, BMA, Sweden.

Streszczenie: Na początku lat 90. XX w. Szwecja doświadczyła silnego kryzysu finansowego, który także przejawiał się turbulencjami na rynku nieruchomości. Ekonomiści uważają, że szwedzki przykład jest dość podobny do globalnego kryzysu finansowego z 2008 r. Uważa się także, że pod koniec lat 80. XX w. w Szwecji wystąpiła nadmierna konsumpcja. W niniejszym opracowaniu badano wpływ inwestycji szwedzkich funduszy emerytalnych ATP na konsumpcję w latach 1961–1994. Z zastosowanej metodologii bayesowskiej wynika, że bardzo prawdopodobnym predyktorem konsumpcji są inwestycje funduszy ATP w papiery hipoteczne. Z problemów Szwecji, które powstały w II poł. XX w., można wyciągnąć wciąż aktualne wnioski dla lokowania inwestycji z przymusowych oszczędności zgromadzonych

w funduszach emerytalnych. Inwestycje funduszy w rynek nieruchomości powodowały wzrost „czystej" konsumpcji, wzrost zadłużenia i tym samym spadek oszczędności netto.

Słowa kluczowe: fundusze emerytalne, konsumpcja, inwestycje, BMA, Szwecja.

1. Introduction

Sweden of the 1980s and 1990s is an interesting example of the strong boom-bust cycle. Many factors were to explain Swedish crisis, including tax reform, financial liberalization, demographic determinants, macroeconomic stability and institutional issues such as enlarging welfare state. In this paper an attempt to investigate the link between pension funds investment portfolio and consumption in Sweden over the period 1961–1994 is made. Since 1964 novel compulsory pension fund was operating, the goal of which was to tax the employees more than it was necessary to pay futures pensioners [Hagen 2013]. The surplus was invested mainly in the government bonds, housing market related financial securities, government debt and share of the Swedish companies.

In the middle of 1990s aggregate consumption pattern in Sweden gained much attention as the economy suffered even more severe meltdown then in the 1930s. Economist argued that over the period before the crisis, prosperity to consume had been somewhat elevated. J. Agell and L. Berg [1996] tested the effect of financial liberalization on the increase in consumption in the 1980s (after major financial market reforms had been introduced). They noted that same facts did not match the common economic environment after the financial market had been liberalized: (i) Debt-to-income ratio was as high as 105% in 1985, (ii) the consumption surge should go in line with house prices increase, but in Sweden consumption rise occurred before housing-boom in the 1980s, (iii) raise in an average prosperity to consume in the middle 1980s was a consequence of decrease in disposable income 1987–1989. K. Eklund [1999] states that the outcome of the government-sponsored housing finance program disturbed somewhat inference of the consumption pattern analysis. It should be noted that both banks and pension funds invested in the housing market and related securities. J. Agell and L. Berg [1996] estimated the Euler consumption function for Sweden 1952–1989, proposed by D.C. Carroll et al. [1994]. They used three different measures of consumption: total consumption expenditures, non-durables expenditures and pure consumption.[1] *Lambda* parameter for pure consumption and non-durables expenditure were roughly the same and smaller than

[1] L. Berg [1996] calculated pure consumption as the sum of nondurable consumption and durable depreciation. R. Hall [1978] advises to remove consumers investment in durables and add imputed service flow of stocks of durables to consumption.

for total consumption expenditure. Their recursive estimates of *lambda* parameters did not confirm rapid change in consumption intertemporal substitution, only after economic crisis had begun the lambda parameter increased rapidly, as credit constraint occurred. J. Agell and L. Berg [1996] noted that using gross business investment and value of export of goods and service as instruments improves estimates of Euler consumption function significantly. K. Eklund [1999] states that deregulation of the credit market in the years 1983–1985 and credit expansion of 1986–1990 had strong impact on the consumption boom. Over the first period lending increased by 17% per annum and during the second one by 73% in real terms. L. Berg and R. Bergström [1995] augmented standard DHSY consumption function with financial and housing wealth. Both augmentation of consumption function improved the model. Financial liberalization spurred financial wealth and so the consumption in the middle of 1980s. They suggested to include the dummy of 1991 tax reform, on the other hand J. Agell et al. [1995] investigated the effects of the tax reform of 1991 on savings and consumption. The tax reform raised real after tax interest rate, which changed savings composition, but had a little effect on consumption. They concluded that it was hard to avoid intertemporal elasticity of consumption close to zero.

L. Berg [1996] found age-specific ratios variable as important in the long-run pure consumption over the period 1950–1995. Estimated long-run linear consumption function, the dependent variable of which was logarithmic level of real *per capita* pure consumption and repressors were logarithmic *per capita* real non-property disposable income, real *per capita* financial net wealth, real *per capita* housing wealth and age-ratios. The linear approach to estimation was partially successful; as the equation did not have short term fluctuation component, errors were autocorrelated, nevertheless as Augmented Dickey-Fuller and Phillips-Peron tests showed residuals were not integrated. The last issue makes that residuals form the model could be included in an error-correction term in a dynamic consumption function.

Literature review suggests that consumption determinants in Sweden during 1961–1994 are not fully explained. The above can be the motivation to use the so-called atheoretical approach such as Bayesian Inference on the model uncertainty. This approach is better than the classical one, when we are not certain of the true model size and repressors, therefore we have to estimate all the possible models and drive *a posteriori* variable inclusion probability for the true model [Gazda, Puziak 2012].

2. Methodology

Bayesian Model Averaging (BMA) is not so easy to apply to the time trends, as most economic variables are either autocorrelated or nonstationary, nevertheless, an attempt has been made. M.S. Geisel [1973] used BMA to compare models of consumption for their predictive ability, concluding that models having lagged consumption as independent variable had the best statistical characteristic. W.A. Brock et al. [2003] evaluated investment-savings curve for the length of lagged variables. Their strategy

was to have one lag of income and ex-post interest rate included in the all evaluated models. They also included deterministic trend and ejected all the models that behaved nonstationarily. P. Białowolski et al. [2014] used BACE methodology to find best predictors for Polish GDP, inflation rate and unemployment. They estimated each model without mixing lags. G. Koop and S. Potter [2003] used BMA to select the most important predictors of inflation in the U.S. The problem of nonstationary was overcome by transforming time series to stationary one, using five various methods: levels, when series was stationary, first, second difference or first, second difference of the log, when series was integrated.

Another problem arises with the model prior and g-Zellner selection. S. Zeugner [2009] described the main issues of the subject. The posterior inclusion probability is proportional to the marginal likelihood of the model times prior model probability and the prior is usually chosen by researcher arbitral, nevertheless are a few priors frequently used. In this research the popular fixed prior to the model size is used, which assumes that all the models are equally probable, but researcher needs to specify the prior model size (i.e. [Sala-i-Martin et al. 2004]). Therefore posterior probability is higher for the most relevant regressors, when compared with uniform prior model size.

g-Zellner prior affects the variance of the parameters. The small *g* implies that we are more certain that parameters are zero. The novel approach to setting *g*-hyperparameter was proposed by [Liang et al. 2008]. Following [Feldkircher, Zeugner 2009] it is better to use *g*-hyper instead of fixed *g*. Therefore BMS package under R-Project environment where above specifications was implemented by M. Feldkircher and S. Zeugner [2013] is used.

In Table 1 all the data used in the calculation are specified. The choice of these potential consumption determinants comes from the literature review.

Table 1. Data used in the study and its sources

Variable	Description	Source
1	2	3
CPF	Logarithm of pure consumption *per capita* in 1991 prices	[Agell et al. 1995, table A1]
YDNP	Logarithm of nonproperty disposable income *per capita* in 1991 prices	[Agell et al. 1995, table A1]
WH	Ratio of Housing Wealth to nonproperty disposable income *per capita* in 1991 prices	[Agell et al. 1995, table A1]
CPND	Logarithm of non-durable consumption *per capita* in 1991 prices	[Agell et al. 1995, table A1]
CP	Logarithm of consumption *per capita* in 1991 prices	[Agell et al. 1995, table A1]
WFN	Ratio of financial net wealth to nonproperty disposable income *per capita* in 1991 prices	[Agell et al. 1995, table A1]

Table 1, cont.

1	2	3
SWE	Ratio of ATP-funds investment in industry, energy and Swedish companies shares to nonproperty disposable income *per capita* in 1991 prices	[Statistical Yearbook of Sweden; Agell et al. 1995, table A1]
BON	Ratio of ATP-funds investment in government bonds to nonproperty disposable income *per capita* in 1991 prices	[Statistical Yearbook of Sweden; Agell et al. 1995, table A1]
HOU	Ratio of ATP-funds investment in housing credits to nonproperty disposable income *per capita* in 1991 prices	[Statistical Yearbook of Sweden; Agell et al. 1995, table A1]
X2044	Ratio between the number of individuals in the age group 20–44 to total population	www.scb.se
X4564	Ratio between the number of individuals in the age group 45–64 to total population	www.scb.se
X65w	Ratio between the number of individuals in the age group over 65 to total population	www.scb.se
REALR	Real after-tax interest rate	[Agell et al. 1995, table A1]
NOMR	The nominal borrowing rate	[Agell et al. 1995, table A1]
INV	Log of the Gross Business Investment	[Agell et al. 1995, table A1]
EXPORT	Log of the Value of Export of Goods and Service	[Agell et al. 1995, table A1]
CRI	Dummy for Swedish banking crisis, 1 for years 1991–1993, 0 otherwise	
LIB	Dummy for capital market liberalization 1 for 1983–1990, 0 otherwise	
D9192	Dummy for tax reform 1 for 1991 and 1992, 0 otherwise	

Source:

3. Age-specific estimation of the pure consumption

The goal is to augment the Berg [1996] model by additional variables reflecting ATP-pension funds investment and dummies that come from the literature review (presented in Table 1). In each panel we use only one age-specific variable, as a problem of collinearity arises. As we have small model space, we use full enumeration. In all the estimations income and age ratio is always included. Our prior model size is fixed to 4 repressors, as the same number used [Berg 1996], so prior inclusion probability is 2/8 for the remaining variable. The outcome is presented in Table 2.

Table 2. Posterior estimates of the long run consumption models with age ratio

Age ratio 20–44				Age ratio 45–64			
Variable	PIP	Post Mean	Post SD	Variable	PIP	Post Mean	Post SD
YDNP	1.000	0.766	0.048	YDNP	1.000	0.689	0.104
X2044	1.000	0.249	0.030	X4564	1.000	–0.241	0.039
HOU	0.117	0.105	0.042	WFN	0.613	0.077	0.023
WFN	0.061	0.035	0.017	HOU	0.431	0.185	0.055
BON	0.042	0.086	0.053	WH	0.250	0.056	0.023
CRI	0.018	0.031	0.025	BON	0.095	0.125	0.060
D9192	0.017	0.033	0.028	D9192	0.081	0.053	0.026
WH	0.017	0.028	0.027	CRI	0.036	0.039	0.026
SWE	0.009	-0.006	0.034	LIB	0.021	0.046	0.043
LIB	0.008	0.003	0.037	SWE	0.019	–0.017	0.044
Age ratio over 65				Dependency ratio			
Variable	PIP	Post Mean	Post SD	Variable	PIP	Post Mean	Post SD
YDNP	1.000	0.467	0.064	YDNP	1.000	0.449	0.080
X65w	1.000	0.522	0.059	dep	1.000	0.481	0.053
WH	0.552	0.056	0.015	HOU	0.550	0.141	0.039
HOU	0.106	0.105	0.040	WH	0.252	0.062	0.020
WFN	0.036	0.030	0.016	WFN	0.147	0.048	0.016
SWE	0.032	0.032	0.019	SWE	0.023	0.026	0.019
BON	0.017	0.048	0.039	BON	0.019	0.051	0.042
D9192	0.011	0.016	0.019	D9192	0.014	0.020	0.020
CRI	0.010	0.009	0.021	LIB	0.010	0.002	0.035
LIB	0.008	–0.008	0.029	CRI	0.009	0.005	0.021

PIP – posterior inclusion probability; Post Means are conditional to the inclusion probability; coefficients are standardized. Highlighted variables are posterior inclusion probable higher than 0.25

Source: own calculation.

Posterior probability inclusion for income and age-ratio variables is 1, as the effect of forced inclusion in the model. For the pure consumption the most relevant effect are housing wealth and pension funds investment in the housing market. In Figure 1 are shown posterior densities of the housing market investment by ATP pension funds for the models with dependency ratio and ratio of individuals 45–64 years-old.

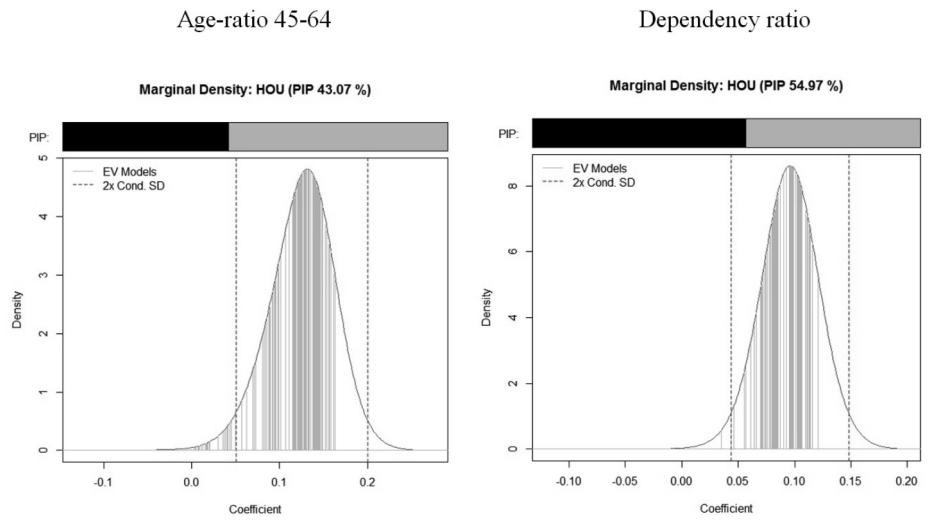

Figure 1. Posterior density of the ATP pension funds investment in the housing market

Source: own study.

In Figure 1 marginal densities of posterior distribution coefficient are plotted, when corresponding variable is included (as presented in [Fernandez et al. 2001]). Two dashed lines are the two times standard deviation. In both presented graphs the coefficients reflecting pension funds investment in the housing market are fairly above zero. From this we can conclude that pension fund investment in the housing market securities spurred pure consumption via wealth effect created on the housing market.

4. True consumption determinants

The next task is to put all the possible determinants of the consumption into one model. At first it is needed to clean the series from the unit root; it is done by differentiating all the series. Augmented Dickey-Fuller test is presented in Table 3. All the variables are not integrated, nevertheless investments in the Swedish company and housing market are near stationary. Our prior model size is 4, so prior inclusion probability is 4/13. Outcome is presented in Table 4. The most important variables for all consumption measures are income and business gross investment as standard macroeconomic model assumes. When financial markets were liberalized, pure consumption changed significantly. After reforms had been gradually introduced, consumption growth was lower than in the previous period. This is a similar implication as in the other study cited above – the Swedish boom-bust did not match the usual outcome of the financial liberalization. It should be also noted that during the

liberalization consumers invested in the stock market. In this case pension funds in the housing market were significant for the overall consumption and non-durable consumption.

Table 3. ADF unit root test

Series	*t*-Stat	Prob.	Series	*t*-Stat	Prob.	Series	*t*-Stat	Prob.
dBON	–4.613	0.001	dEXPORT	–4.247	0.002	dREALR	–7.864	0.000
dCP	–3.109	0.036	dHOU	–2.788	0.075	dSWE	–2.614	0.101
dCPF	–3.069	0.040	dINV	–3.137	0.034	dWFN	–4.772	0.001
dCPND	–3.574	0.012	dNOM	–4.849	0.001	dWH	–3.213	0.031
						dYDNP	–3.829	0.007

d before variable name denotes first difference.

Source: own calculation.

Table 4. Posterior estimates of the long run consumption models for pure consumption, non-durable consumption and overall consumption

Pure consumption				Non-durable consumption			
Variable	PIP	Post Mean	Post SD	Variable	PIP	Post Mean	Post SD
1	2	3	4	5	6	7	8
dYDNP	0.993	0.508	0.124	dYDNP	0.955	0.459	0.142
dINV	0.807	0.429	0.153	dINV	0.686	0.400	0.172
LIB	0.680	–0.309	0.121	dHOU	0.663	0.318	0.143
dWH	0.448	0.253	0.127	LIB	0.492	–0.287	0.144
dREALR	0.385	0.186	0.098	dREALR	0.344	0.195	0.122
D9192	0.288	0.265	0.205	dSWE	0.291	0.212	0.159
dSWE	0.262	0.211	0.156	dBON	0.256	0.218	0.198
dEXPORT	0.200	–0.138	0.110	dNOM	0.223	–0.153	0.144
dHOU	0.190	0.155	0.133	dWFN	0.220	–0.168	0.186
CRI	0.190	–0.267	0.324	CRI	0.185	–0.099	0.248
dBON	0.190	–0.171	0.171	D9192	0.162	–0.002	0.226
dNOM	0.172	0.129	0.116	dWH	0.162	0.093	0.188
dWFN	0.141	–0.121	0.154	dEXPORT	0.130	0.006	0.146
Consumption				Consumption (continued)			
Variable	PIP	Post Mean	Post SD	Variable	PIP	Post Mean	Post SD
dYDNP	0.804	0.379	0.142	dWFN	0.169	–0.104	0.195

Table 4, cont.

1	2	3	4	5	6	7	8
dINV	0.733	0.473	0.185	dREALR	0.168	0.106	0.137
dHOU	0.506	0.284	0.146	D9192	0.161	–0.039	0.236
dNOM	0.372	–0.233	0.141	dSWE	0.150	–0.005	0.184
LIB	0.337	–0.229	0.151	dWH	0.146	0.039	0.192
CRI	0.285	–0.283	0.238	dEXPORT	0.135	0.044	0.144
dBON	0.169	0.077	0.204				

PIP – posterior inclusion probability; Post Mean are conditional to the inclusion probability; coefficients are standardized. Highlighted variables are posterior inclusion probable higher than 4/13 = 0.308.

Source: own calculations.

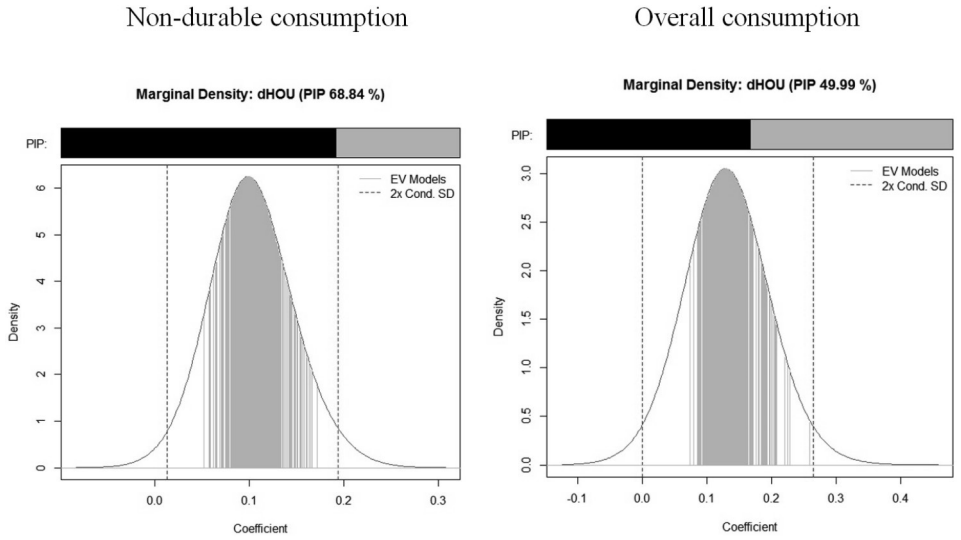

Figure 2. Posterior density of the ATP pension funds investment in the housing market

Source: own study.

Housing investment by the pension funds posterior densities indicate positive sign both with age ratio 45–64 and dependency ratio included.

The next task is to repeat previous procedure, but for the lagged variables of order 1, the one lag of the dependent variable is also included. Our prior to the model size is 4 repressors, so prior inclusion probability is 4/14 = 0.29. Outcome presented in Table 4 implies that the highest posterior inclusion probability are Swedish banking crisis dummy with strong negative sign and tax reform of 1991 with strong positive sign, which suggests that lagged consumption determinants are less

important to the "true" model, nevertheless one lag of the pension fund investment in the housing market has significant posterior inclusion probability in the model for non-durable consumption function with positive sign.

Table 5. Posterior estimates of the long run consumption models for pure consumption, non-durable consumption and overall consumption (one lag)

Pure consumption				Non-durable Consumption			
Variable	PIP	Post Mean	Post SD	Variable	PIP	Post Mean	Post SD
CRI	0.938	–0.929	0.270	CRI	0.522	–0.421	0.262
D9192	0.873	0.721	0.230	dYDNP1	0.421	0.278	0.174
dYDNP1	0.589	0.350	0.149	dREALR1	0.331	–0.212	0.169
dCPF1	0.341	0.299	0.186	dCPND1	0.322	0.236	0.198
dINV1	0.233	0.251	0.207	D9192	0.303	0.283	0.322
dHOU1	0.203	0.159	0.149	dHOU1	0.297	0.211	0.181
LIB	0.197	–0.180	0.184	dINV1	0.232	0.152	0.207
dBON1	0.190	–0.219	0.238	dBON1	0.231	–0.152	0.209
dREALR1	0.164	–0.128	0.222	dWH1	0.222	–0.137	0.187
dSWE1	0.155	0.110	0.163	dWFN1	0.219	0.119	0.181
dEXPORT1	0.146	0.100	0.134	LIB	0.208	–0.107	0.182
dNOM1	0.144	–0.095	0.139	dNOM1	0.206	–0.098	0.153
dWH1	0.126	0.018	0.161	dSWE1	0.198	0.099	0.182
dWFN1	0.124	0.039	0.167	dEXPORT1	0.172	0.042	0.150
Consumption				Consumption (continued)			
Variable	PIP	Post Mean	Post SD	Variable	PIP	Post Mean	Post SD
CRI	0.705	–0.010	0.009	dNOM1	0.222	–0.017	0.050
dYDNP1	0.533	0.138	0.160	dINV1	0.215	0.011	0.036
dCP1	0.356	0.102	0.181	dWFN1	0.198	0.002	0.008
D9192	0.251	0.002	0.006	dBON1	0.184	–0.011	0.054
dWH1	0.242	–0.003	0.007	dEXPORT1	0.162	0.006	0.031
dHOU1	0.239	0.022	0.059	LIB	0.155	0.000	0.001
dREALR1	0.231	–0.013	0.039	dSWE1	0.155	0.005	0.045

PIP – posterior inclusion probability; Post Mean are conditional to the inclusion probability; coefficients are standardized. Highlighted variables are posterior inclusion probable higher than 0.29.

Source: own calculations.

In Figure 3 one lagged posterior pension fund investment is plotted. Lower band of the two times conditional is less than zero, nevertheless in all the enumerated model sign was positive.

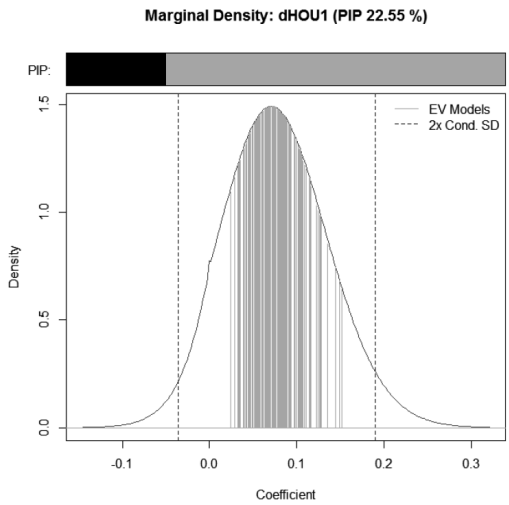

Figure 3. Posterior density of the ATP pension funds investment in the housing market

Source: own study.

5. Conclusions

The procedure of the Bayesian Model Averaging was repeated several times for different specifications. Our prior was that pension funds investment has significant impact on the consumption. We found that the most important consumption driver was pensions fund investment in the housing market, which outperforms even the impact of the housing wealth.

In the specifications, when age ratio 45–64 was included we found that investment in the housing market was more important consumption predictor than housing wealth, on the other hand, when age ratio over 65 was included, housing wealth was the strongest consumption driver after income. The last finding is consistent with the life-consumption theory which assumes the most important consumption driver in the 65 and over age group is the net financial wealth.

The past example of Sweden, which is often compared to the present one of the current financial crisis can shed new light on the pension fund role in the creation of crisis. The mechanism of the compulsory savings produces compulsory investments in the long term assets such as housing, which in turn spurs non-durable consumption. When demographic rent gains momentum government sees that demographic wave that produced that rent is going to retire in some time, so tries to save excess money. The best guess is that excess money should be utilized in national infrastructure, champions company, housing programs, etc. Especially the last one via wealth effect spurs pure consumption and debt so reduces net financial wealth.

References

Agell J., Berg L., 1996, *Financial liberalization and macroeconomic stability*, The Scandinavian Journal of Economics, vol. 98, no. 4, pp. 579–601.

Agell J., Berg L., Edin P.A., 1995, *The Swedish boom to bust cycle: Tax reform, consumption and assets structure*, Swedish Economic Policy Review, vol. 2, no. 2, pp. 271–314.

Berg L., 1996, *Age distribution, saving and consumption in Sweden*, Revised version of paper prepared to the 10th Anniversary Meeting of the ESPE Uppsala University, Sweden, June 13.–15, 1996.

Berg L., Bergström R., 1995, *Housing and financial wealth, financial deregulation and consumption – the Swedish case*, The Scandinavian Journal of Economics, vol. 97, no. 3, pp. 421–439.

Białowolski P., Kuszewski T., Witkowski B., 2014, *Dynamic factor models & Bayesian averaging of classical estimates in forecasting macroeconomic indicators with application of survey data*, NBP Working Paper No. 191, https://www.nbp.pl/publikacje/materialy_i_studia/191_en.pdf.

Brock W.A., Durlauf S.N., West K.D., 2003, *Policy Evaluation in Uncertain Economic Environments*, Brookings Papers, http://www.brookings.edu/~/media/projects/bpea/spring-2003/2003a_bpea_brock.pdf (12.03.2016).

Carroll D.C., Fuhrer J.C., Wilcox W.D., 1994, *Does consumer sentiment forecast household spending? If so, why?*, The American Economic Review, vol. 84, no. 5, pp. 1397–1408.

Eklund K., 1999, *The Swedish banking crisis: Roots and consequences*, Oxford Review of Economic Policy, vol. 15, no. 3, pp. 80–97.

Feldkircher M., Zeugner S., 2009, *Benchmark Priors Revisited: On Adaptive Shrinkage and the Supermodel Effect in Bayesian Model Averaging*, IMF Working Paper, no. WP/09/202, https://www.imf.org/external/pubs/ft/wp/2009/wp09202.pdf (1.04.2016).

Feldkircher M., Zeugner S., 2013, *Package 'BMS'*, http://cran.r-project.org/web/packages/BMS/BMS.pdf (23.04.2016).

Fernandez C., Ley E., Steel M.F., 2001, *Model Uncertainty in Cross-Country Growth Regressions*, Journal of Applied Econometrics, vol. 16, pp. 563–576.

Gazda J., Puziak M., 2012, *Zastosowanie metod bayesowskich w badaniach nad wzrostem gospodarczym w regionach*, [in:] Kokocińska M. (ed.), *Etapy konwergencji w rozwiniętych krajach Unii Europejskiej*, Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu, Poznań.

Geisel M.S., 1973, *Bayesian comparisons of simple macroeconomic models*, Journal of Money, Credit and Banking, vol. 5, no. 3, pp. 751–772.

Hagen J., 2013, *A History of the Swedish Pension System*, Uppsala Center for Fiscal Studies Working paper 2013:7, http://ucfs.nek.uu.se/digitalAssets/228/228584_120137.pdf (11.04.2016).

Hall, R., 1978, *Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence*, Journal of Political Economy, vol. 86, no. 6, pp. 971–987.

Koop G., Potter S., 2003, *Forecasting in Large Macroeconomic Panels Using Bayesian Model Averaging*, Federal Reserve Bank of New York Staff Reports, no. 163, http://www.newyorkfed.org/research/staff_reports/sr163.pdf (11.04.2016).

Liang F., Paulo R., Molina G., Clyde M.A., Berger J.O., 2008, *Mixtures of g priors for Bayesian variable selection*, Journal of the American Statistical Association, no. 103 (481), pp. 410–423, doi:10.1198/016214507000001337.

Sala-i-Martin X., Doppelhofer G., Miller R.I., 2004, *Determinants of long-term growth: A Bayesian Averaging of Classical Estimates (BACE) approach*, American Economic Review, vol. 94, pp. 813–835.

www.scb.se.

Zeugner S., 2011, *Bayesian Model Averaging with BMS*, http://cran.r-project.org/web/packages/BMS/vignettes/bms.pdf.