Impulse Response Functions among Employment, Marriage and Birth

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Abstract

Japan is now facing the aging population and one of the reasons is the tendency to marry later. Some papers indicate that more and more the number of women labor grows, birthrate grows. However there is possibility that increasing in female labor force is not the best solution for the aging population. This paper examines how much what type of employment and which gender will contribute to greaten the number of marriages and births, using the structural vector autoregression (SVAR) model. The main findings are (i) the increase of Women Full Time worker is the most favorable option to increase the number of two, (ii) the increment of marriages is not involved with the addition to births.

CONTENTS

1. INTRODUCTION

Aging society is a serious problem in Japan. Many villages are going to disappear near future. Rural settlements are worried about severe depopulation. Less population means less employment and less employment happens less population. Other than the village problem, there are a lot of problems which is caused by the falling birthrate. One of the reason why the birthrate is falling is young people do not tend to marry. The lower average and unstable to rising of salary might cause that. Many papers indicate more and more female forces participate in the society, birthrate would grow and therefore Japan and companies should expand adopt flame. Thence this paper examined what types of employment and which gender would have a big effect on the number of marriages and births.

Previous research that directly analyzes this theme is not found. Discussion paper that inspired this theme is Yuko Kinoshita and Guo Fang (2015).

The main questions we ask in this paper are what type of employments and which gender is the highest effect to deal with the Low Birth Rate Problem

and Tendency to Marry Later and whether the rate of change of marry is linked with the number of births.

The contribution of this paper to the literature are two-fold. First, there are few to examine the category of employment and gender types to verify with structural vector autoregression model (SVAR model). Second, unexpectedly paper inspecting the relationship between marriages and births statistically is a quite minority.

The paper is organized as follows. In the next section, I present my empirical analyses and discuss implications in Section 3. Finally, Section 4 concludes the paper and suggests future research.

2. EMPIRICAL ANALYSIS

2-1 Data and Methodology

This paper has two models, the non-recursive four-variable Structure Vector Autoregressive (SVAR) model and five-variable SVAR model. The first model includes following variables: marriage, the regular men employment, the non-regular men employment, the regular women employment, the non-regular women employment. Second model add birth to above model. To ensure stationarity of variables, rates of changes are used in this paper.

The definition of “rate of changes” in case of m that means Marriage is

below.

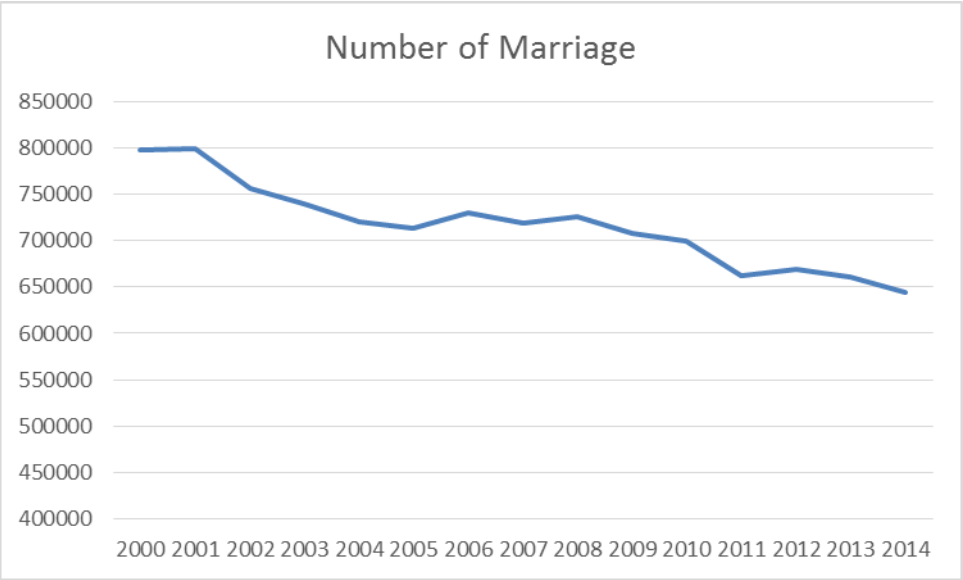
$$\frac{m_t - m_{t-1}}{m_{t-1}}$$

The SVAR model is more useful when we demonstrate relationships between variables which are endogenously impacted at the same time than VAR model. For example, VAR model cannot explain the simultaneous effect among variables. However the SVAR model remedies this problem by controlling determinant. The SVAR model also show how much and how long a variable affect another variable.

The main data sources are the Statistics Bureau of Japan and Ministry of Health, Labour and Welfare. The data is annual data for 2000-2014.

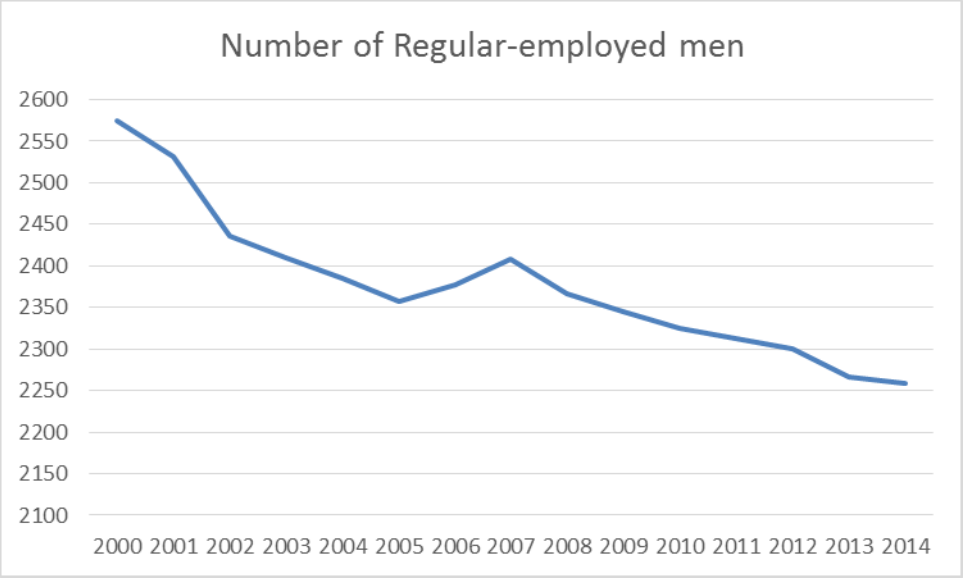
2-2 Explanatory Variables and SVAR Models

Marriage (variable m)



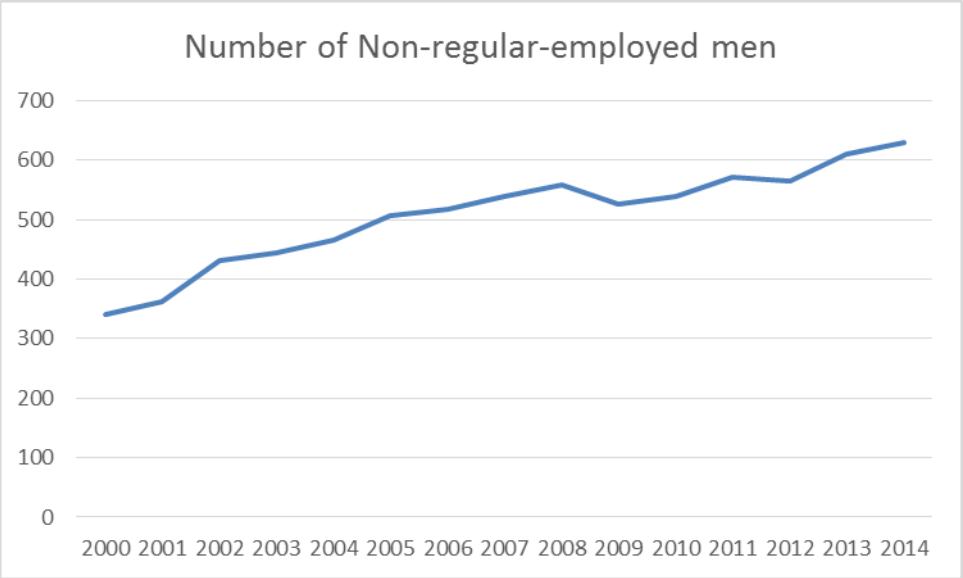
Number of marriage is decreasing annually. The present number is about 80% of 2000.

Regular-employed men (variable rm)



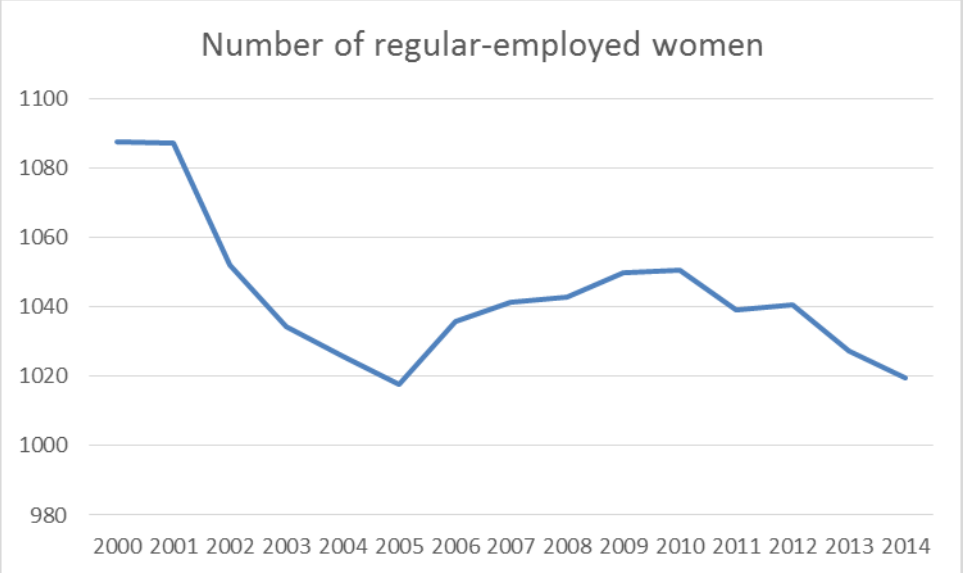
Number of regular-employed men also decreased about 3,000,000 from 26,000,000.

Non-regular-employed men (variable nm)



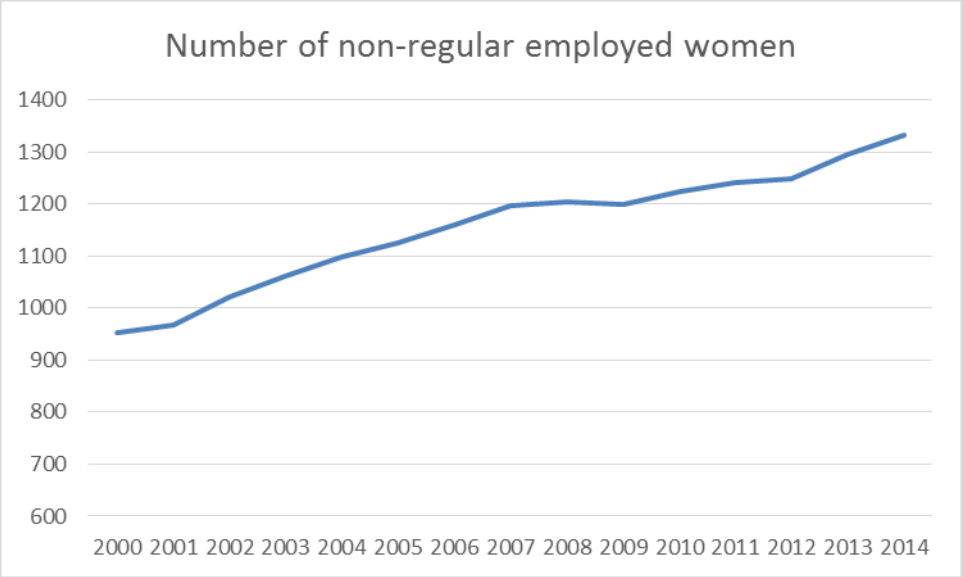
Non-regular-employed men doubled from 2000. A part of this is explained by development of Information Technology industry (Asano 2011 http://www.rieti.go.jp/jp/publications/dp/11j051.pdf).

Regular-employed women (variable rw)



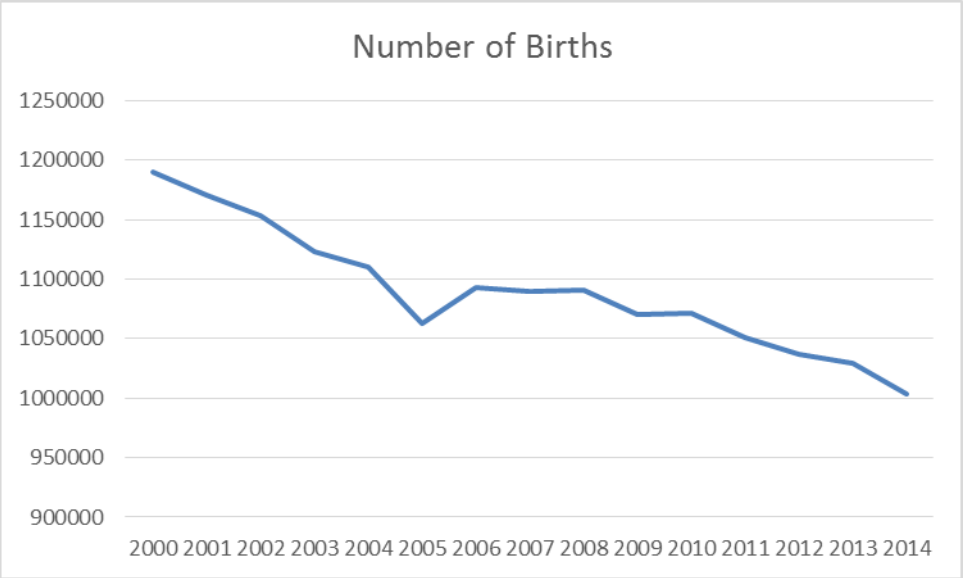
Though number of regular-employed women had been decreasing for 2000 and 2005, after 2005 it made the large extensive. The reason is the Equal Employment Opportunity Law was amended.

Non-regular-employed women (variable nw)



This number is constantly increased as the pair of dual income is also penetrating into society.

Birth (variable c)



The number has a tendency to decline. This reason is requirements of money expanded and the same as two incomes couple grows.

SVAR models

Two SVAR models are made for presuming impulse response effect. First model includes rm, nm, rw, nw and m. Second has m, rm, nm, rw, nw, c. The smallest AICs are 1. After AIC=2 is $-\infty$ because of a shortage of data.

First model

$y_t=(rm_t,nm_t,rw_t,nw_t,m_t)$

$\Phi_0 y_t= \alpha + \Phi_1 y_{t-1}+ \varepsilon_t \quad \varepsilon_t \sim W.N(\Sigma)$

Φ_0 is assumed as below. An element of matrix that is affected by another variable simultaneously is put by ρ. For example, rm is impacted by nm at the same time and the factor is written as ρ.Variables rm, nm, rw, nw

and m are put in order from left to right and from to bottom. Regular-employed men is affected by Non-rengular-employed men and in case of women is the same assumption. Marriage is influenced by all variables.

$$\begin{pmatrix} 1 & \rho_1 & 0 & 0 & 0 \\ \rho_2 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \rho_3 & 0 \\ 0 & 0 & \rho_4 & 1 & 0 \\ \rho_5 & \rho_6 & \rho_7 & \rho_8 & 1 \end{pmatrix}$$

Second model

$z_t=(m_t,rm_t,nm_t,rw_t,nw_t,c_t)$

$\phi_0 z_t = \alpha + \phi_1 z_{t-1} + \varepsilon_t \quad \varepsilon_t \sim W.N(\Sigma)$

ϕ is supposed as below and variables simultaneously impacted is ρ. Variables m, rm, nm, rw, nw and c are put in order from left to right and from to bottom. The hypothesis is the same as First model.

$$\begin{pmatrix} 1 & \rho_1 & \rho_2 & \rho_3 & \rho_4 & 0 \\ 0 & 1 & \rho_5 & 0 & 0 & 0 \\ 0 & \rho_6 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & \rho_7 & 0 \\ 0 & 0 & 0 & \rho_8 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

2-3 Empirical Results

Summary of First SVAR model (coefficient is a part of Reduced form VAR model)

	Rm	Nm	Rw	Nw	M	const	Adj.R^2
Estimate	2.161	0.250	-1.313	-0.927	-0.155	0.733	0.074
t-value	2.044	1.099	-0.855	-1.224	-0.335	0.364	

Φ_0 is below.

$$\begin{pmatrix} 1 & 0.0660 & 0 & 0 & 0 \\ 3.192 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0.260 & 0 \\ 0 & 0 & 0.549 & 1 & 0 \\ 0.814 & 0.065 & -2.154 & -0.879 & 1 \end{pmatrix}$$

A variable of the most effective Impulse response function is rw(Figure 3) and second is rm(Figure 1). Variable rw is guessed that it is shocked by strong economy because it immediately and clearly has a reaction.

Summary of Second SVAR model (coefficient is a part of Reduced form VAR model)

	M	Rm	Nm	Rw	Nw	C	const	Adj.R^2
Estimate	0.076	0.467	0.165	1.253	-0.007	-0.923	-1.841	0.265

t-value	0.238	0.615	1.075	0.952	-0.012	-2.354	1.022	

ϕ_0 is below.

$$\begin{pmatrix} 1 & 1.681 & 0.367 & -5.072 & -1.119 & 0 \\ 0 & 1 & 0.830 & 0 & 0 & 0 \\ 0 & 3.135 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0.376 & 0 \\ 0 & 0 & 0 & -0.617 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

A variable of the most effective Impulse response function is rw(Figure 8) and second is rm(Figure 6). However rw takes commanding lead over variable m. Variable rw is reckoned that it is impacted by strong economy because it immediately and sharply has a reaction. Birth takes about 11 months. The obvious reaction which is one year later is not genuine.

The cumulative impulse effect is below table. The number in parantheses is the cumulative impulse effect of three phase and later.

%	M	Rm	Nm	rw	nw
m	-	0.918	0.048	1.112 (0.401)	0.275
c	0.095	-0.026	0.013	1.791 (0.809)	-0.001

3. CONCLUSIONS

First, the regular-female labor is the key to improve marriage rate and birth rate. We should arrange environment for women to work easily and rear children. Non-regular employed female labors is not involved with births. Therefore, we should pay special attention to how the companies expand adoption planned number of people.

Second, marriage does not spread to births. This means money is the matter to bring up a child. It is meaningless for solving the falling birthrate to accelerate marriages.

Third, the regular-male labor is important for marriage. On the other hand, it has no effect on births and it is less than the non-regular-male labor. This might be caused by educational inequality. The regular-male labor is often well-educated. Conversely non-regular-male labor tends less educated than regular labors. Therefore there might be gap to raise children between regular-male labors and non-regular-male labors.

4. REFERENCES

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5. FIGURES

Figure1

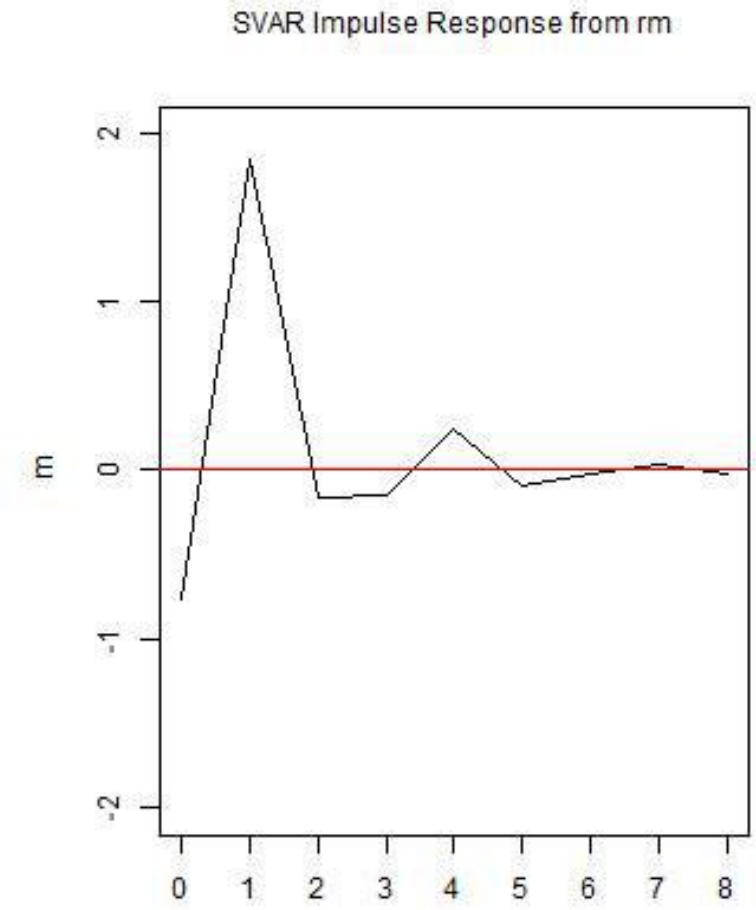
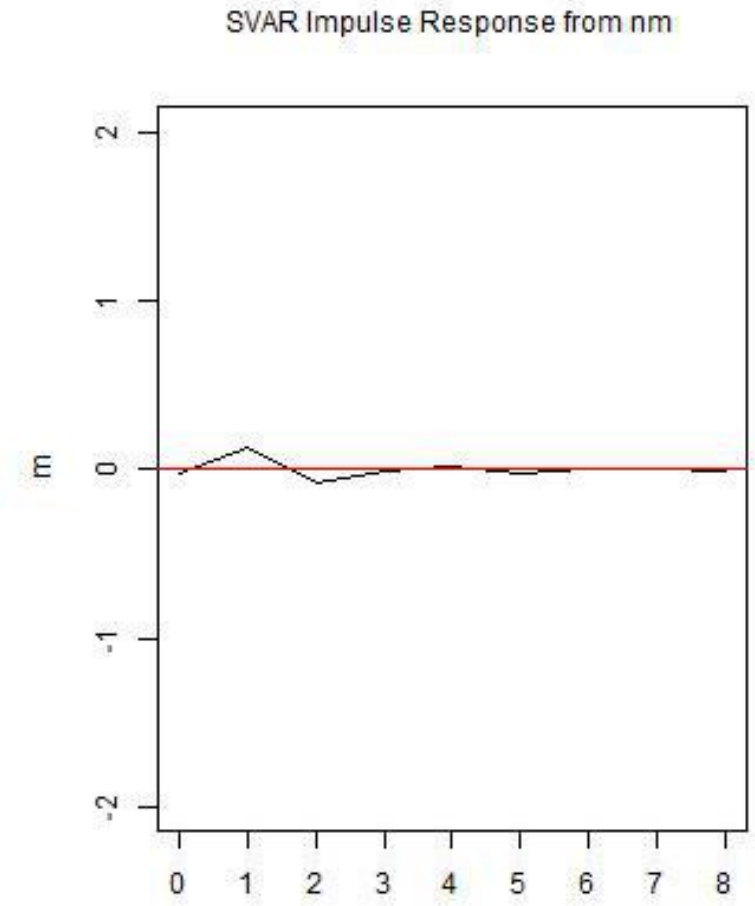


Figure2


SVAR Impulse Response from nm
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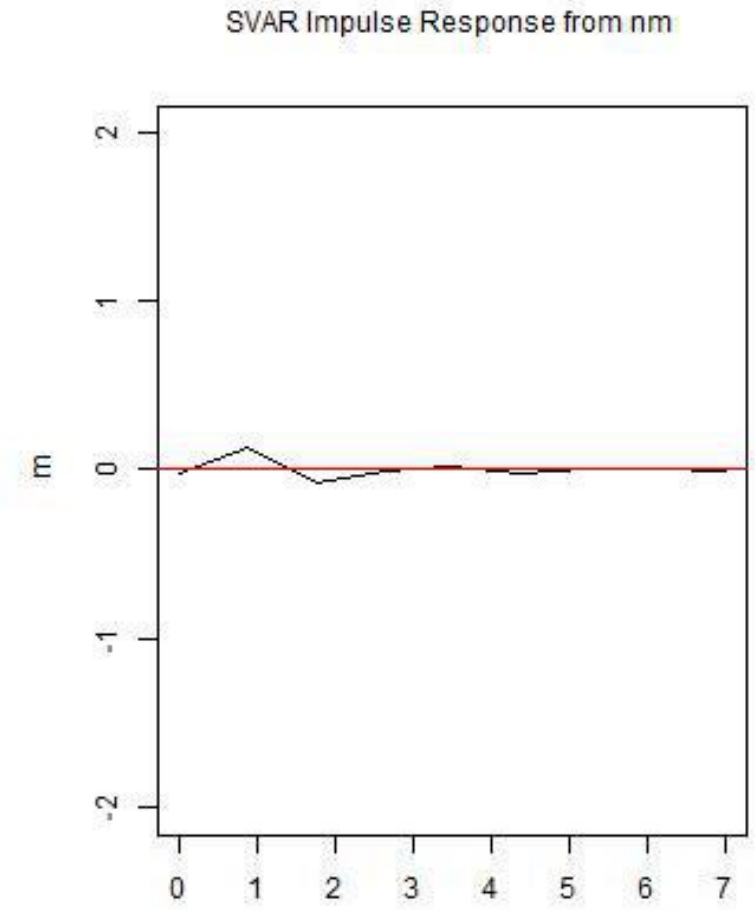


Figure3

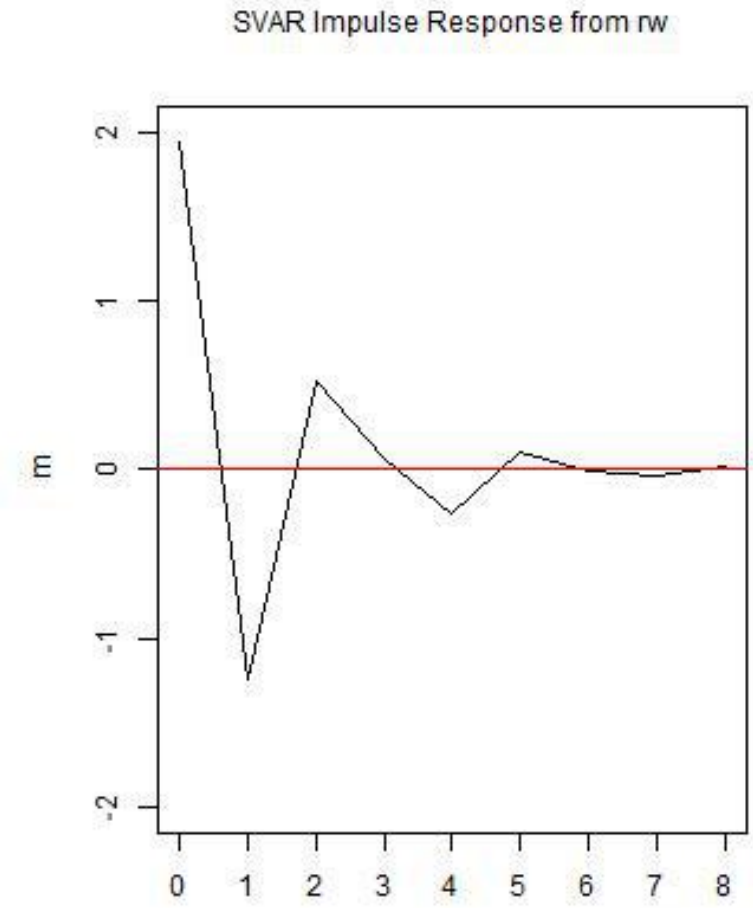


Figure 4

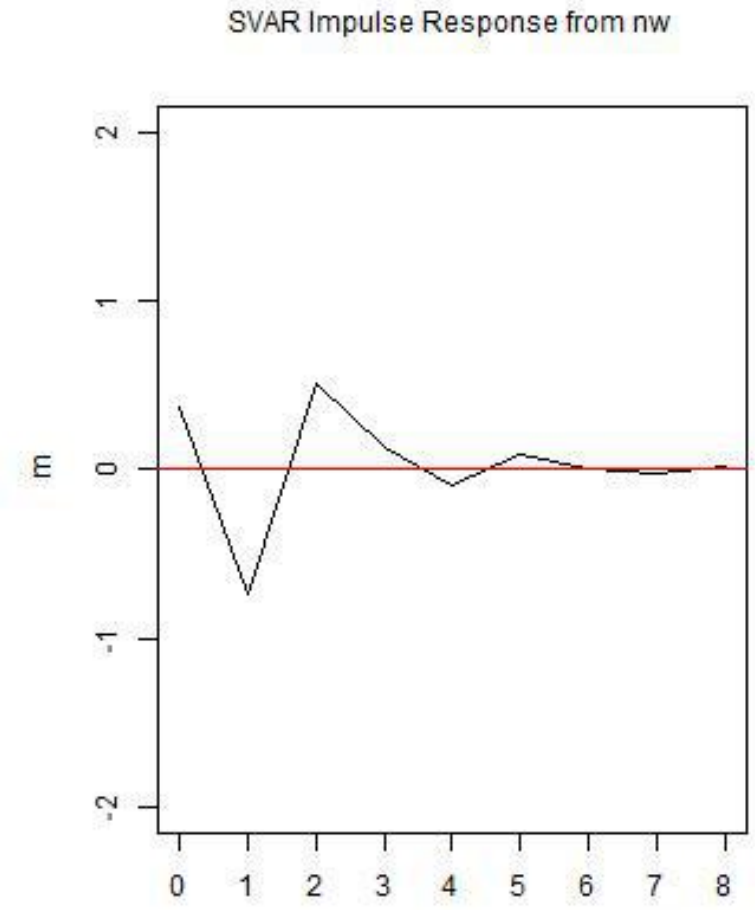


Figure5

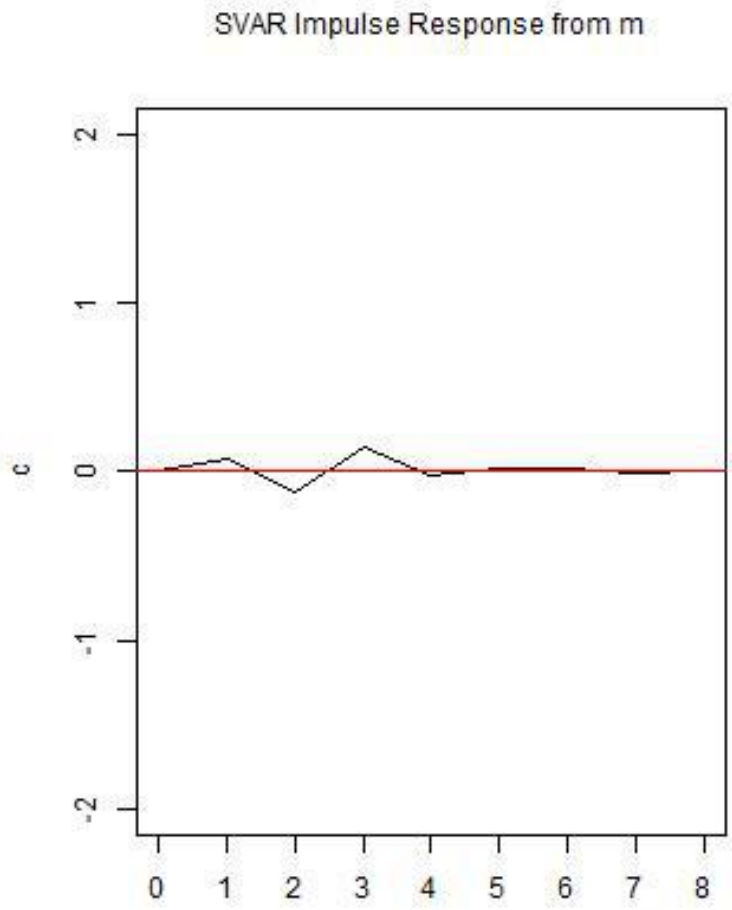


Figure 6

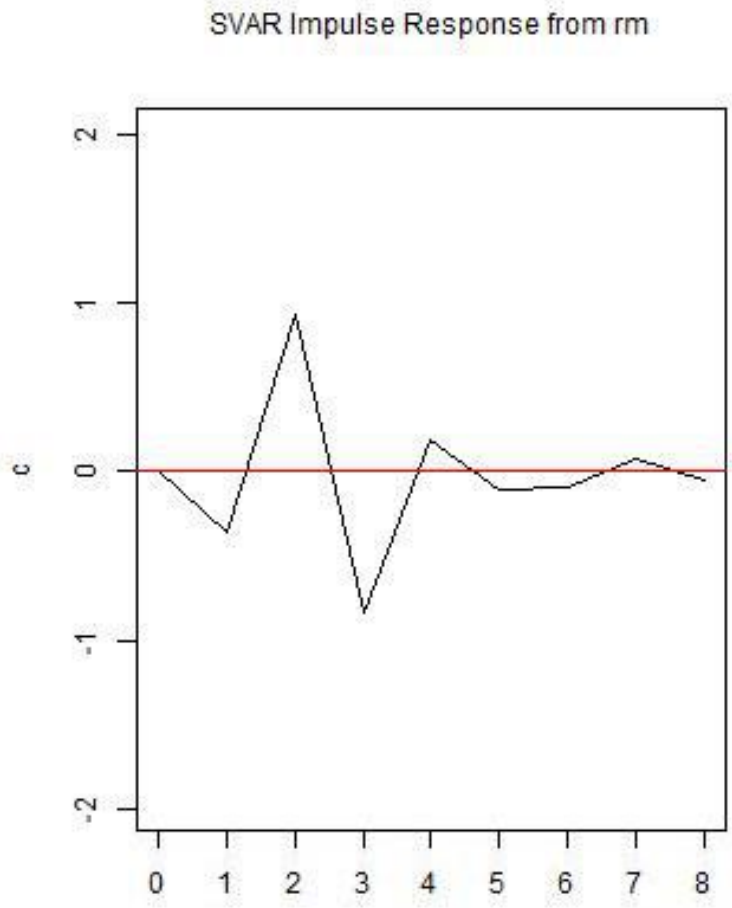


Figure7

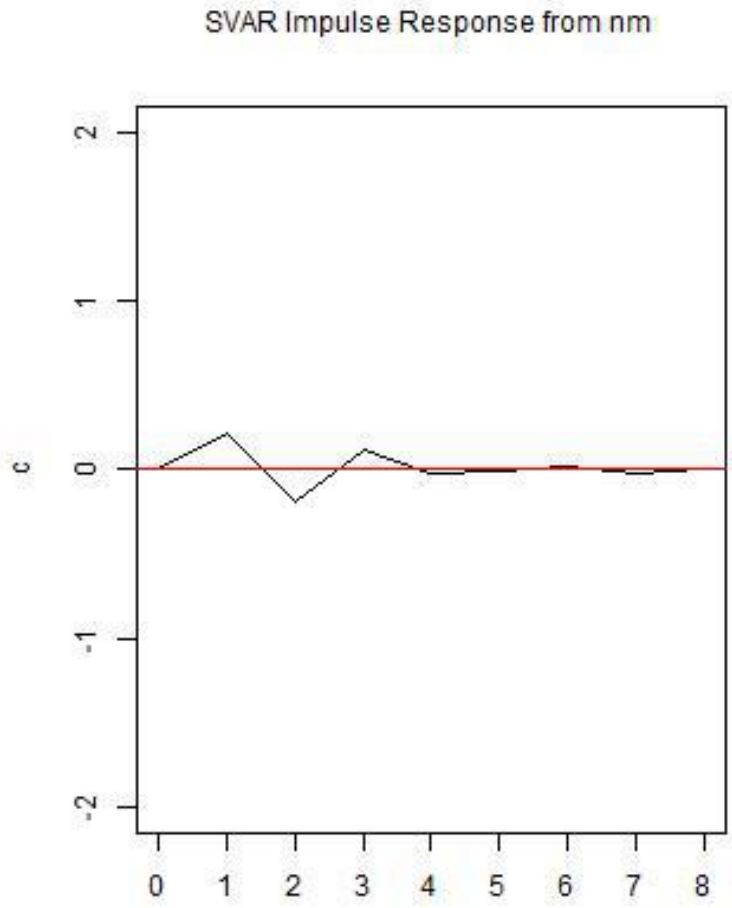


Figure8

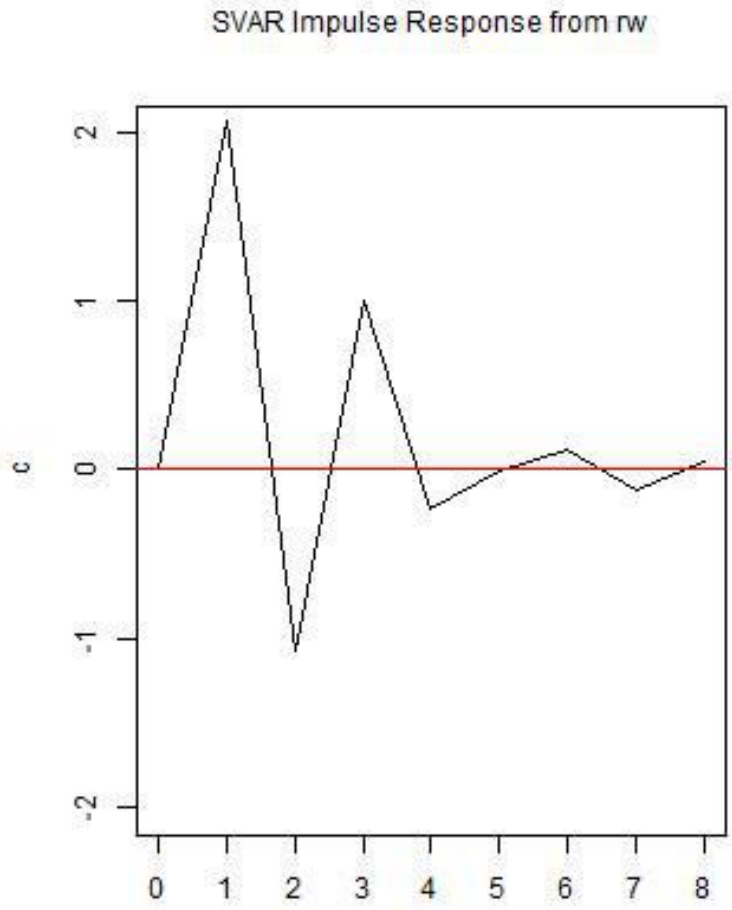
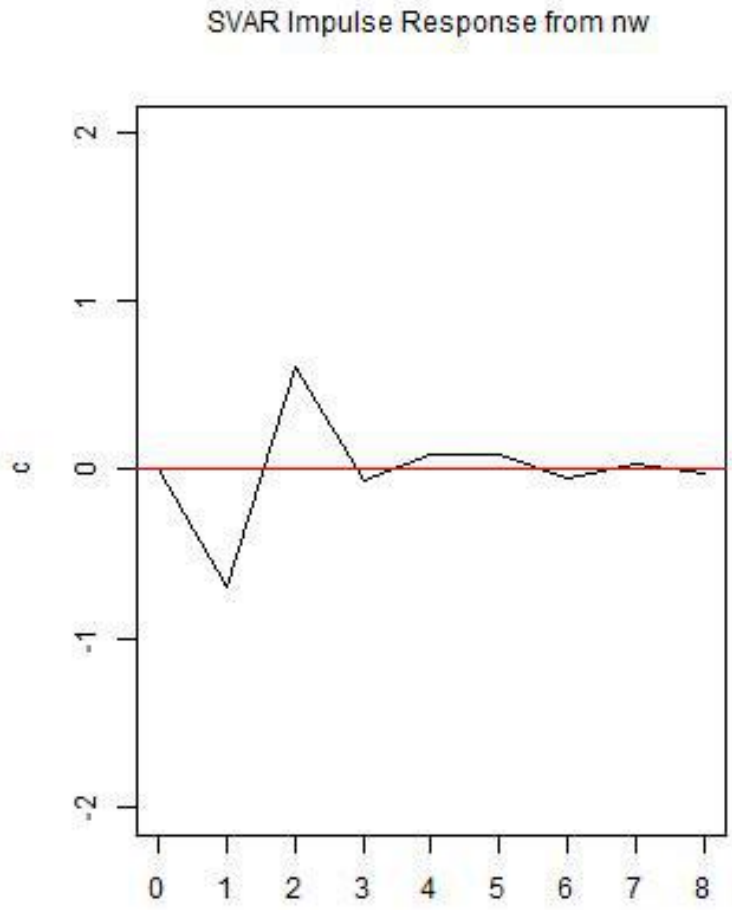


Figure9


SVAR Impulse Response from nw
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