Empirical revelation of the Austrian business cycle theory in Japan

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Abstract

The Austrian business cycle theory suggest that monetary policies can change relative prices in the economy, leadings to unsustainable changes in the structure of production and ultimately decreasing efficiency as the structure of production corrects. This paper uses VAR and VEC estimations with Impulse Response Functions to extract the impact of Japanese monetary policies on domestic structure of production, as defined in the Austrian capital theory, between the years 1983 and 2017. The measures of stages of production is calculated in similar manner as previous research by Lester & Wolff (2013). This means that early and late stage indexes of producer prices and production is normalized by intermediate stage indexes of producer prices and production. The findings are mixed between the different approaches utilized to capture the stance of monetary policies. However, the results suggest that the short-term target Policy rate of the Bank of Japan have had a negative correlation with early- and late stage production relative to intermediate production, which is reasonably in line with the conventional version of the Austrian business cycle theory.

"But to think of interest only as a direct cost factor is to overlook its main influence on production." - F A Hayek, 1935, p.83

Innehållsförteckning

1. Introduction

1.1 Background

Austrian economist F A Hayek was one of the first to address that the loose monetary policies conducted by the Federal Reserve during the 1920s would soon lead to a bust (Nobel Prize Committee, 1974). Austrian economists argued that loose monetary policies lowered the market rate of interest below the “natural” rate of interest, i.e. below the rate that prevails on a private market which tends to neither increase, nor decrease, the market rate. This induced investors to invest more, but at the same time consumers to save less and consume more. This may seem nonproblematic, but not from an Austrian prospective. Briefly, when combining the Austrian capital theory with Wicksell’s (1936 [1898]) market for loanable funds, Mises (1953 [1912]) argued that a credit expansion, designed and maintained by a central bank, would lead to an unsustainable intertemporal *structure of production*, ending in a recession when the market corrects. If the *Austrian business cycle theory* is correct it implies efficiency losses derived from the fact that some scarce resources will be lost in this correction process. This highlights the importance of understanding the causes of business fluctuations. The aim of this research is to examine the empirical revelation of the Austrian business cycle theory in Japan.

The Austrian capital theory hovers around the intertemporal structure of production (Garrison, 2001). Briefly, the structure of production can be explained as composed of different stages of production, which ultimately results in consumable output. One peculiar aspect of the Austrian business cycle theory is that changes in the market rate will alter the composition of this structure of production. These changes can be sustainable or unsustainable, depending on cause. According to the theory, a deviation of the market rate from the natural rate, sets two incompatible mechanisms in motion, which leads to an unsustainable structure of production (Garrison, Ibid.). This is the essence of the Austrian business cycle theory, mainly a development from the Austrian capital theory laid out by e.g. Menger and Böhm-Bawerk in the late 19th Century and Wicksell´s market for loanable funds. This research revolves around capturing how monetary policies have been correlated to fluctuations in the intertemporal structure of production, a peculiar part of the Austrian business cycle theory.

Both the Monetarists and the Austrians agree that increasing the interest rate may induce the coming bust. However, the Monetarist solution to an already started recession is to loosen the monetary policy, while the Austrian solution is to leave the market to correct on its own. The recession is seen as a side effect derived from the correction process which the economy experiences when liquidation of previously "malinvestments" takes place. (Powell, 2002)

Kuttner & Pose (2001) argues that some economists have seen the Japanese deflation *"as representing positive structural change"*, and further argues that it may be best for the monetary policy maker not to respond, if not the cause of the deflation is demand related or due to previously bad monetary policies. They (Ibid.) asserts that the Japanese recessions may, according to several observers, be due to a reallocation of resources to more productive uses, but following structural changes derived from e.g. the progress in information technology in the late 20th Century. Kaihatsu & Kurozumi (2010) argued that the notion that business fluctuations are caused *mainly* by technology stocks are being re-considered following The Great Recession. They (Ibid.) conducted an empirical research including Japan and found that financial shocks where *least* as explanatory. However, the idea that financial disturbances causes business fluctuations is since the early 20th Century the main believe within the Austrian school of thought.

Shortage of microeconomic data have made it complicated a task to search for empirical revelation of the Austrian business cycle theory. Whereof there are relatively little empirical researches conducted related to this theory. Nonetheless, there are several empirical researches aimed at testing aspects of the theory. For instance, Keeler (2001) found some empirical support of the theory in data covering the US from 1950 up to (then) present. More particular, Keeler (Ibid.) found a relatively high correlation between INCOME and the slope of the YIELD curve. The slope of the YIELD curve captured the gap between the market rate and the natural rate, which according to the Austrian School is a critical aspect for explaining business fluctuations.

Mulligan (2006) investigated the empirical correlation between real consumable output and the term-spread, i.e. long- less short-term interest rates, for the US between 1959 and 2003. Mulligan (Ibid.) found a negative relationship, which accordingly supported the thesis that the lowered term-spread makes the structure of production less "roundabout". Less roundabout can hastily be described as a shorter average period of production. Lester & Wolff (2013) further estimated the effect of the Federal Fund Rate on the domestic structure of production, but found vague, and partly contradictory, empirical revelation of the Austrian business cycle theory.

Most empirical researches have concentrated on the US economy, but this research makes use of e.g. OECD data called "stage of processing" producer price index covering the *Japanese* production. This stage of processing data is available for a few countries, whereof Japan is one of them. I'm not aware of any conducted research of this kind for Japan, which makes the possible contributions from this research "new". The stage of process data is categorized with respect to how remote production are from consumer demand. This data is hence similar to the data utilized by Lester & Wolff (2013) and Cohen & Luther (2014). To capture monetary policies, I have calculated a variable called $TaylorGap$, which is similar to one of Cohen & Luther (Ibid.) explanatory variables. I have further utilized the short-term target policy rate of the Bank of Japan and the monetary base as two other explanatory variables. Furthermore, the statistical approach in this research is similar to those of previously researches done for the US, which makes comparisons feasible.

Friedman (1959) argued that the question is not whether the assumptions made when modelling a theory is correct or not, and he believed that they seldom were, but rather whether the theory was empirically revealed. Friedman (1993) further rejected the Austrian business cycle theory on these grounds. Friedman's approach to economic theory is opposed to that of, among others Hayek (1941), who argued that reality consists of so many circumstances, that even if the theory is correct and implies a more roundabout structure of production, empirical revelations may suggest the opposite. In these aspects, this research follows the Friedman (1959) approach and looks for empirical revelations of the Austrian business cycle theory in data covering Japan between the years 1983 and 2017. The main purpose of this research is to contribute to the sphere of empirical understanding of business fluctuations. To my help have been three VAR- and VEC models, Granger tests and Impulse Response Functions.

1.2 Disposition

Chapter 2 – In this chapter a neat explanation of the theoretical framework is positioned. In the end of this chapter a null hypothesis is defined.

Chapter 3 – In this chapter a discussion of the operationalization, i.e. how to capture what I want to capture, is positioned.

Chapter 4 – Here all the data is presented.

Chapter 5 – In this chapter the utilized methodology and regression model specification is presented.

Chapter 6 – Here the results from the VECM and VAR estimations, IRFs, Granger causality tests and some performed diagnostics is presented and analyzed.

Chapter 7 – In this last chapter a neat discussion of the findings is positioned.

2. Theoretical framework

This chapter explains the market for loanable funds, the intertemporal structure of production and the aggregated PPF. Later in chapter 2.2.4 and 2.3 these are integrated and the theory of boom and bust is explained. Finally, in chapter 2.4 a null hypothesis for this paper is defined.

2.1 Main literature

The *Austrian business cycle theory* was developed by the Austrian economists Ludwig von Mises and F A Hayek during the first half of the 20th century. The theory was set forth by Mises (1953 [1912]) in his book *The Theory of Money and Credit*. Mises (Ibid.) did an attempt to predict the consequences of a credit expansion designed and maintained by an authority. In 1928 Mises and Hayek set up an institution for business cycle research. In 1931 and 1935 Hayek's book *Price and Production,* where the business cycle theories were further developed was published. Hayek's final book on capital theory *The Pure Theory of Capital* was released in 1941 and is frequently used for references in this chapter. In *The Positive Theory of Capital* (1930 [1888]) Böhm-Bawerk mentions the concept of roundaboutness, which is mentioned throughout this paper. In recent years Roger W. Garrison's (2001) *Time and Money – The macroeconomics of capital structure* has been a popular book on the theory and will be commonly referred to in this paper.

2.2 The capital-based macroeconomic model

Garrison (2001) calls his approach to macroeconomics "capital-based macroeconomics" to distinguish it from other macroeconomic theories which includes less capital theory. To understand the Austrian business cycle theory, one must first understand the dynamics of the economy according to the theories. To graphically illustrate the capital-based macroeconomic theories, Garrison (2001) developed a three-quadrant model. It consists of the market for loanable funds, the intertemporal structure of production and an aggregated Production Possibility Frontier consisting of all sustainable combinations of consumption and investment. In the rest of this chapter I will first describe these three "components" separately. Secondly, I will connect the components, and lastly, the suggested effects of monetary policies, according to the then already presented theories, will be presented, the so-called Austrian business cycle theory.

2.2.1 The market for loanable funds

"THERE is a certain rate of interest on loans which is neutral in respect to commodity prices, and tends neither to raise nor to lower them." (Wicksell, 1936 [1898], p.102).

The natural rate of interest is determined by the equilibrium of demand and supply for loanable funds and is, according to Wicksell (Ibid.), necessarily equal to the rate that would have prevailed if real capital were the utilized means of exchange, i.e. in a barter economy. The prevailing market rate must not always be equal to the natural rate, but market mechanism will tend to rise the market rate if its lower than the natural rate and lowering the market rate if its higher than the natural rate. For example, if the market rate is lower than the natural rate, prices will increase. The increase in prices will increase demand for loanable funds which will then shift to the right, leading to an increase in the market rate. But it may take time for the market rate to adjust, temporarily eventually leading to considerable changes in prices. (Wicksell, 1936 [1898])

The supply and demand of loanable funds is in Garrison's (2001) model are defined in net terms, also including equity shares and retained earnings. The supply of loanable funds implicitly defines peoples time preferences. Reduced time preferences will accordingly shift the supply curve of loanable funds to the right. The demand for loanable funds implicitly defines entrepreneur's willingness to invest and participate in the production stages, which depends on their expected profit. (Garrison, 2001) More precisely the natural rate depends on *"the thousand and one things which determine the current economic position of a community" (Wicksell, 1936 [1898]).* Garrison (2001) point out that since the future is unknown, and profit calculations hence can be wrong, the market rate represent the *expected* profit and not the true future profit.

A keynote assumption within economics is that reduced consumption means increased savings, vice versa and ceteris paribus. This lowers the market rate, and possible also the natural rate, which leads to increased investments, ceteris paribus. In conventional theories there is a discrepancy between the short- and long-run effects of increased savings. Increased savings may in the Keynesian model lead to reduced real output through the theorem of thrift (Garrison, 2001), while in the "long-run" Solow growth model increased savings increases real output. The Austrian approach is somewhere in between. Garrison (2001, p.40) sums up the Austrian standpoint by that people *"save-up-for-something (SUFS)"* and that *"Increased saving now means increased consumption sometime in the future and hence increased profitability for resources committed to meet that future consumption demand"*. This is so because people are assumed to have time preferences. People will want to consume less today to be able to consume more in the future, which is an important assumption in this theory. Changes in liquidity preferences is not of primary concern in this analysis, as they are in the Keynesian framework (Garrison, 2001).

If people become thriftier, the financial intermediaries gets more funds. To be able to lend these additional funds they must lower the rate of interest. How low the interest rate will go, given a certain amount of additional funds to lend, depends on the expected profit by entrepreneurs. This means that the additional funds available will be lent to those entrepreneurs finding the most profitable utilization of the funds. (Hayek, 1935)

2.2.2 The intertemporal structure of production

"Before we can attempt to understand the influence of prices on the amount of goods produced, we must know the nature of the immediate causes of a variation of industrial output." (Hayek, 1935, p.32)

To explain business fluctuations, Hayek (1935) thought it was best to begin with a situation already explained by the general body of economics, which apparently was the situation where all scarce resources are employed. One advantage with this assumption is that it directs the attention to changes in *methods* of production. The Austrian approach suggests that capital accumulation, as a rule is accompanied by changes in the methods of production as well (Hayek, 1941). In the standard Solow-model[1], solely the rate of technological progress allows for increased growth rate of output per worker (Romer, 2012). On the other hand, Hayek (1941) argued that a lowered interest rate makes it more likely that latent resources, and also *latent methods* of production taking longer time to perform, which was not profitable to utilize at the higher discount rate, will become profitable to utilize at the lowered rate, leading to efficiency gains[2]. Hence, in one way a lower interest rate, due to a higher saving rate, can lead to increased

[1] More on the Solow growth model in part 2.2.4.

[2] The reason for the efficiency gains is simply that if people discount future profit at a lower rate it makes the projects and methods of production taking longer time to perform relatively more profitable than before. Hayek (1941) discusses the proposition that a more time-consuming method of production would lead to efficiency gains. Hayek (Ibid., p.60-61) argues that *"there will almost always exist potential but unused resources which could be made to yield a useful return, but only after some time; and that the exploitation of such resources will usually require that either resources, which could yield a return immediately or in the near future, have to be used in order to make these other resources yield any return at all. This simple fact fully suffices to explain why there will*

(utilized) technology in the society, even though the knowledge about how to utilize the latent resources, and hence the latent methods of production, may have existed for many years, or even been utilized before. More on growth in chapters 2.2.4.

Hayek (1935) used a triangle to illustrates the intertemporal structure of production. The triangle in Figure 2 consists of all stages of production, from the "earliest" at the extreme left to the "latest" at the extreme right. This is a simplified snapshot of the current structure at time t, where time is only implicitly defined through the stages of production on the horizontal axis. (Garrison, 2001) The shape of the triangle can change over time. The time dimension in the Hayekian triangle *"measures the extent to which valuable resources are tied up over time"* (Garrison, 2001, p.66). However, one example of early stage production is mining, and one example of late stage production is assembling of hammocks.

In every stage there is value added, which means that the height of every stage can be interpreted as the sum of value added in the previous stages plus the value added in the current stage, whereof the hypotenuse of the Hayekian triangle has a positive slope. The area of the triangle represents the totality of all stages of production necessary, *at any point of time*, to "*secure*" a stationary state of output (Hayek, 1935). With stationary state output means the same level of output in time t_1, t_2,…t_∞. Hayek (Ibid.) distinguishing between "original means of production" and "specific means of production", where the former are by assumption relatively more useful in early stages of the process of generating a consumable output. A "highly" specific means of production is for example a machine made to produce a specific output, which may or may not also be a mean of production in another stage.

Whether the current structure of production remains depends on if the profit calculation of entrepreneurs remains the same or not, which ultimately depends on the prices of input and the prices of output in different stages of the production process. Consider the slope of the steeper hypotenuse in Figure 1 as the initial structure of production. If consumers become thriftier, their demand for "producers' goods" in terms of demand for "consumption goods" will increase. The prices of producers' goods will increase relative to those of consumer goods. But the essential here is that producer good prices will increase to a relatively different extent in the different stages of production, i.e. relative prices changes. (Hayek, 1935) In the penultimate stage of production, the decrease in consumer prices "*will be felt more strongly than the effect of the*

always be possibilities of increasing the output obtained from the available resources by investing some of them for longer periods."

increase of the funds available for the purchase of producers' goods of all kinds" (Hayek, 1935, p.75). What justifies this reasoning will be described in a moment. However, the price in the last stage will thus fall more than that in the penultimate stage, which means that the *"margin"* in prices between these last two stages must decrease. This smaller margin is illustrated graphically by the flatter hypotenuse. This makes the earlier stages *relatively* more profitable than the later stages of the production process. In all stages there will be a downward pressure in prices derived from the lowered demand for consumer goods, which Garrison (2001) calls the *"derived demand effect"*. There will also be an upward pressure from what Garrison (Ibid.) calls the *"time-discount effect"*. This latter effect derives from the increased demand for investment goods, which lowers the interest rate and reasonably entrepreneurs time-discount rate. The negative derived demand effect will outweigh the positive time-discount effect in late stages of the production process, vice versa. The result is that early stages will expand relative to later stages. The hypotenuse in the Hayekian triangle in Figure 1 will have become flatter. Also notice that the triangle is lengthened, which is just to say that longer production processes, previously not profitable, are now being undertaken. The structure of production has become more "roundabout[3]" than before.

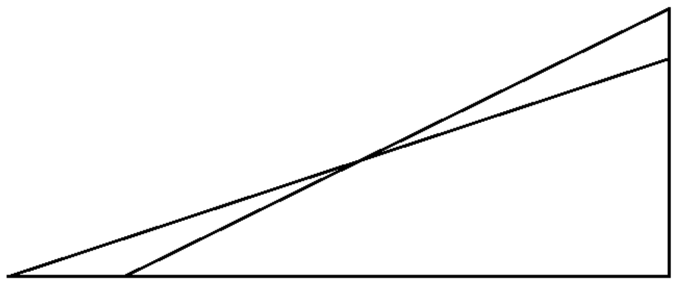


Figure 1. The Hayekian triangle. The triangle consists of the intertemporal stages of production. The flatter hypotenuse illustrates a relatively more roundabout structure of production. Also notice that the "margin" between the stages is smaller with the flatter hypothenuse. Source: own.

A short explanation of why the positive time-discount effect outweighs the negative derived demand effect in the earlier stages of the production process is what follows here next. First, the magnitude of the change in the price of a factor derived from a shift in demand for that factor, depends of course on the elasticity of supply. But if we assume an initial equilibrium with full employment of scarce resources and further assume that the discounted value of the marginal product of a factor, in terms of the final stage of the production process, is to be equalized in all stages of the production process, then Hayek (1935 & 1941) argues that we can

[3] For a more exhaustible clarification of the meaning of "roundabout", see e.g. Böhm-Bawerk (1930 [1888]).

derive the change in demand for the factor in the different stages of the production process that will occur when the time-discount rate changes. Here next is a short explanation over how the "time-discount effect" works.

Figure 2 displays five stages of the production process, ranging from "a" to "e", where "a" is the earliest stage and "e" is the last stage. For simple illustration, the time interval is equal between all stages. The curves i_1 and i_2 are called *discount curves*, where the higher discount curve corresponds to a lower discount rate by the entrepreneurs. The ten downward sloping curves are the discounted value of the marginal product in terms of the final stage, discounted at the two different discount rates. The marginal product curves describe the contribution of one more input of a factor, in anyone stage, to the final product. In Figure 2 the marginal productivity curves are similar in all five stages just for simplicity, but in reality they will of course differ, which will be considered in a moment. If the discount rate is initially i_2, the discounted value of the marginal product of a factor measured in terms of the final stage can be illustrated by the five dotted curves. The dotted horizontal line named P_2 correspond to the allocation of the factor in question, such that the discounted value of the marginal product of the same factor in terms of the final stage will be equal in all stages. This at the discount rate i_2. The profit maximizing amount of the factor allocated to each stage is then represented by the horizontal distance between the vertical axises and the discounted marginal product curves. When the discount rate decreases to i_1, the discounted marginal product curves are shifted upwards, and if the total amount of the factor in question remains constant, then the new profit maximizing allocation of the factor between the stages can be read out from line P_1. As highlighted by the signs on the horizontal axis, the allocation of the factor will have to be adjusted. The reason to why the curve in stages e is not discounted is because investing in that stage ties up funds for a very short period of time. If the structure of production becomes absolutely more, or less, roundabout depends on if the discount rate increases or decreases.

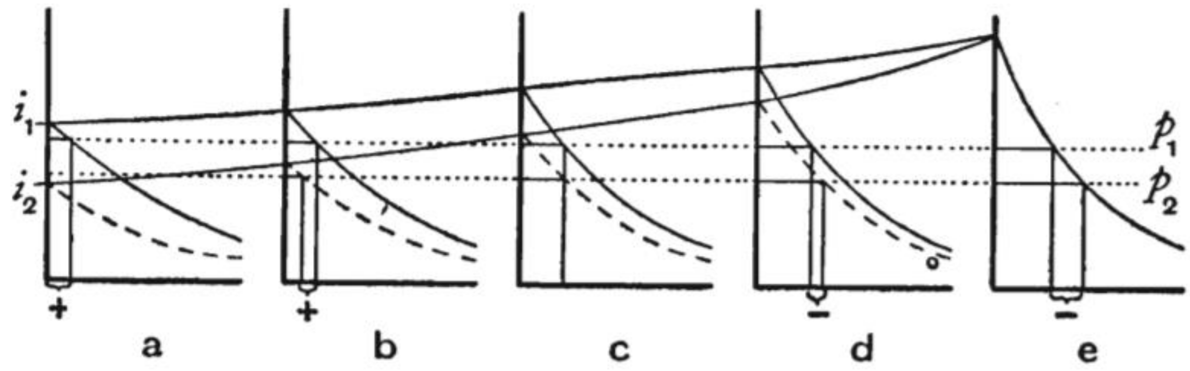


Figure 2. The time-discount mechanism. "a" is more remote in time from where value is captured, i.e. stage "e", and is hence more discounted because entrepreneurs have time preferences. Source: Hayek (1941).

Suppose further that the marginal product of a factor is diminishing at a relatively low rate when utilized in early stages, and at a relatively high rate utilized in later stages. Then the price of that factor should reasonably rise relatively more when the discount rate decreases than the price of factors´ whose marginal product are diminishing at a relatively high rate when utilized in the early stages. This highlights how the "marginal productivity structure" in the economy will have impact on the change in relative prices. According to Hayek (1935) this is what determines the magnitude of the change in demand for a factor and the changes in relative prices between the factors of production. Even if the marginal product curves are the same in all stages, the structure of production will be altered to become more roundabout when the interest rate is lowered. The point is that even if the changed discount rate may have a low effect on demand for a factor in late stages of the production process, it will have a relatively large effect in earlier stages, which changes the relative demand between the stages and leads changes in relative prices for the factors/means of production (Hayek, 1941). More precisely, the relative price of original means of production will by assumption increase since they are relatively more useful in early stages where the time-discount effect is strongest. If longer production processes are started, and the later stages margin in input-output prices have become smaller, there should be some stage where the positive time-discount effect starts overwhelms the negative derived demand effect. This is illustrated in Figure 1 by the intersection of the two hypothenuses[4].

It might further seem fetched that the entrepreneurs in the new earlier stages could manage to "outbid" the producers in the later stages whom found the utilization of the factors profitable already at the previously higher interest rate. But a reallocation of these factors to earlier stages is still reasonable according to Hayek (1935). This since the relative price of the factors highly useful in early stages of the production process have increased, which makes a "release" of

[4] Full employment of resources is assumed for the new equilibrium.

these factors from later to the earlier stages of the production process relatively more profitable from the perspective of late stages producers. The late stage producer will hence release some factors which are now relatively more demanded in the early stages and instead buy intermediate products/factors (Hayek, Ibid.).

A more exhaustive analysis of this is very complex since it depends on inter-relationships between the factors of production. For example, if we assume the "conventional capital K", and labor L, if more K than before is utilized in one stage, the marginal productivity of L in that stage is reasonably increased. And maybe these kind of relationships between marginal productivities is what Hayek (1941) had in mind when he argued that even if the ratios of factors utilized in the economy as a whole may change when the discount rate change, the methods of production *within* the different stages must not necessarily change.

2.2.3 The Production Possibility Frontier PPF

Garrison (2001) has constructed a Production Possibility Frontier (PPF) consisting of what he refers to as all *"sustainable combinations"* of consumption (C) and investments (I). He assumes that there is one combination of consumption and investment on the PPF, a stationary state, where the *"gross investments is just enough to offset capital deprecation" (Garrison, 2001, p.58).* If consumers become thriftier, i.e. they will save more and consume less, the economy moves to a new point clockwise along the PPF where overall consumption is lower and investments higher[5]. Garrisons (2001) "secular growth", discussed in the next part, will then shift the sustainable PPF outwards, as illustrated in Figure 3. If people instead had become less thrifty, "secular contraction" will occur and shift the sustainable PPF into the previous PPS[6], as also illustrated in Figure 3. The economy can expand beyond[7] the PPF temporarily, but it's per definition not sustainable and the market mechanisms described in the previous chapter will take the economy back to the sustainable PPF, or even into the PPS. The possibility of a movement into the PPS will be considered in chapter 2.3. The points on the sustainable PPF is such that there is a "natural" rate of unemployment in the economy. For a welfare state with a

[5] We have assumed that less consumption means more saving, which in turns mean more investments.
[6] Production possibility set.
[7] The PPF is not technically binding. But expanding beyond is possible by undermaintenance of existing capital etc., so it is not considered to be "sustainable".

balanced budget, the PPF can be thought of as a “net PPF” consisting of all possible sustainable combinations of C and I (Garrison, 2001)[8].

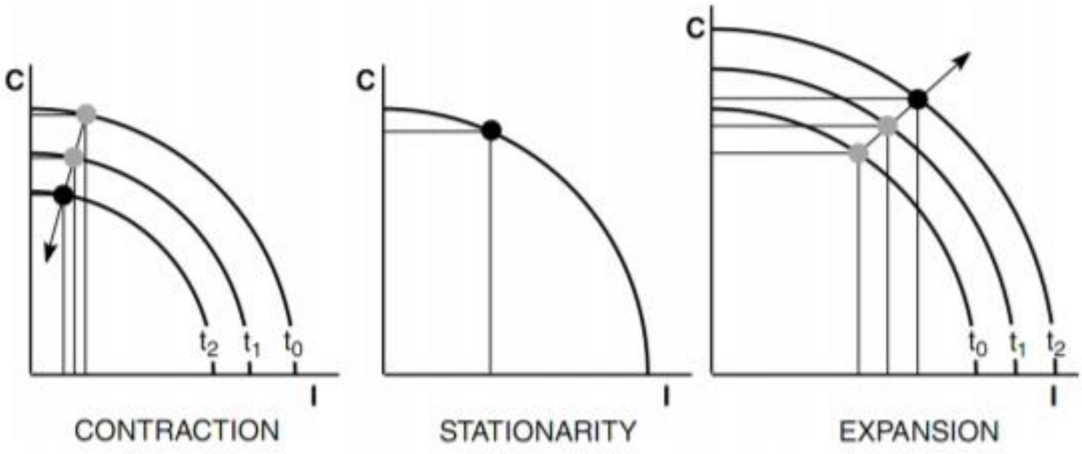


Figure 3. Sustainable PPFs. To little investments relative to consumption results in a shift of the PPF toward origin, vice versa and ceteris paribus. The PPFs t_0, t_1, and t_2 illustrates how the economy is growing over time. Source: Garrison (2001).

2.2.4 The capital-based macroeconomic model

If we connect the market for loanable funds, the intertemporal structure of production with the Hayekian triangle, and the sustainable PPF we can illustrate the dynamics of the economy as Garrison (2001) have done in Figure 4. If we start from a stationary state equilibrium, i.e. the middle quadrant in Figure 3, and now assume that people become thriftier, i.e. their demand for producers´ goods increases relative to consumption goods. Then the net supply of loanable funds shifts to the right, from S to S´ as depicted in Figure 4. This lowers the interest rate from i_{eq} to $i´_{eq}$, since the financial intermediaries must lower the interest rate to lend it. Since the underlying reason for this is changed time preferences, both the natural rate and the market rate initially decreases. In the new equilibrium investments and savings are higher and consumption expenditures is lower. The economy moves clockwise on the sustainable PPF and the Hayekian triangle becomes more roundabout due to the mechanisms described in chapter 2.2.2. The reversed would have occurred if consumers instead had become less thrifty.

[8] A discussion of how different tax systems would alter this net PPF is outside the scope of this paper.

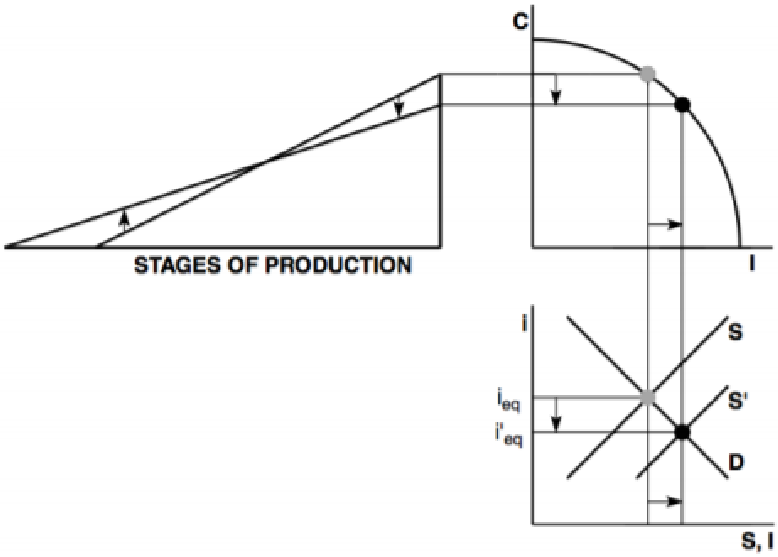


Figure 4. The dynamics of the economy. Source: Garrison (2001).

Since we started with a stationary state equilibrium, the shift in supply for loanable funds from S to S´ will lead to net investments. Net investments will, with a lag, also shift the demand for loanable funds to the right, this because the new larger capital structure needs more maintenance. But also *"to accommodate future demands for consumer goods that are growing in proportion to current demands"* (Garrison, 2001, p.54). Since both supply and demand shifts to the right, the market rate and the natural rate will be relative stable at the initial level i_{eq}, but still there will be both capital maintenance and capital accumulation, leading *also* to an outward shift in the sustainable PPF and the Hayekian triangle, as illustrated in Figure 5. (Garrison, 2001) Garrison (Ibid.) refer to this as *"secular growth"* and argues that the growth rate of an economy depends on the ratio between investments/savings and consumption.

It's been discussed within the Austrian school about "secular growth", where some have argued that changed preferences may only lead to a new stationary state (Murphy, 2017). According to Garrison (2001, p.54) secular growth accrues when *"investment is sufficient for both capital maintenance and capital accumulation".* This sound similar to "net investment" in e.g. the Solow growth model ($\dot{k} > 0$). According to Garrison (Ibid.) the increased savings can result in real growth, assuming constant technology. Romer (2012) argues that a permanent increase in savings may have a temporarily effect on real growth in the Solow model, this before the new "steady state" is reached. Hence the word *temporary* deserves some attention. Romer (Ibid.) further shows that, with estimated parameters, within the Solow model it takes approximately 17 years to get halfway to the new steady state when the saving rate increases by 10 percent. Murphy (2017) finds that, assuming (1) a Cobb-Douglas production function with alpha set equal to 0.5, a (2) 5 percent capital deprecation rate, (3) zero growth of L, and (4) an initial steady state with 5 percent saving rate, an increase to a 10 percent saving rate would boost real growth for several generations. Murphy (2017) further argues that, due to the example just given, that the neoclassical model of saving induced growth is relatively compatible with the secular growth concept, even though the mechanisms differs.

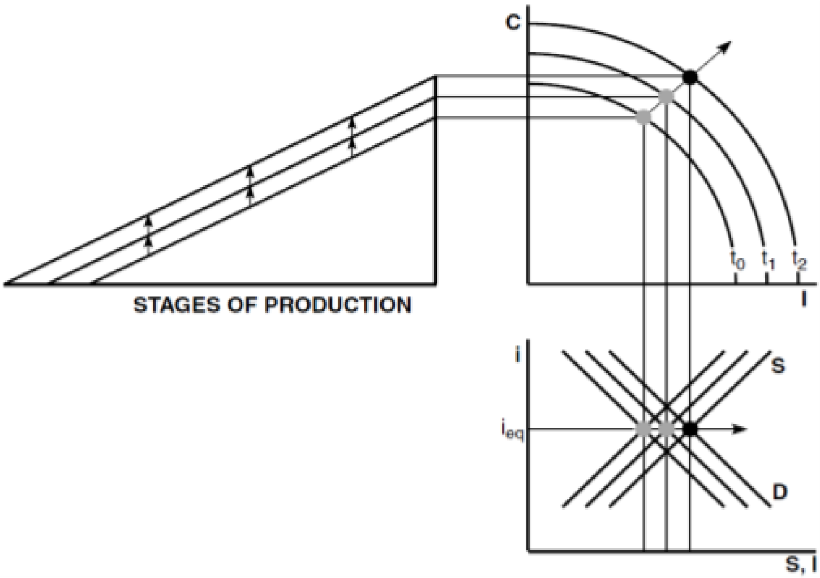


Figure 5. Secular growth in Garrison´s model. The PPFs t_0, t_1, and t_2 illustrates how the economy is growing over time. Source: Garrison (2001).

2.3 The Austrian business cycle theory

We can now use the Garrison (2001) model to illustrate the causes of business fluctuations. Assume that the monetary policy maker for some reason decides to lower the market rate by increasing the supply of loanable funds (increase the demand for producers good). The supply curve for loanable funds will then shift to the right, from $S´$ to $S´ + \Delta M_c$, and the market rate will decrease from i_{eq} to $i´$. Since preferences are assumed to be unaffected, the natural rate is also assumed to be unaffected at i_{eq}. We also assume, as does among others Hayek (1935), that the newly created money reaches the entrepreneurs first as new credit for projects, and first with a time lag the consumers as increased incomes. We further assume an initial full, or “natural”, employment equilibrium.

The new money enters the market through the banking system, where the banks must lower the interest rate to find borrowers (Hayek, 1935). This means that entrepreneurs now find cheaper credit, and the discount rate in their profit calculations will then reasonably decrease. As explained in the chapter about discounted value of the marginal products of factors in different stages of production above, if the discounted value of the marginal product of factors in terms of consumer goods are to remain the same in all stages of production, the structure of production will have to become relatively more roundabout.

The lowered market rate will also induce consumers to consume more, or equivalently save less, this since their time preferences are assumed to be unaffected. In Hayek's (1935) language, their demand for consumers goods will increase, and their demand for producers' goods will decrease. Consumers are not shifting their supply curve for loanable funds, but rather it can be graphically illustrated as if they move down along the "old" supply curve (Garrison, 2001). In the private economy, increased demand for consumption goods, due to changed time preferences, would have been accompanied with decreased savings, or equivalently reduced demand for producers' goods (Hayek, 1935). This would have increased both the natural rate and the market rate. If the discounted value of the marginal products in terms of consumer goods were to be equalized in all stages of production, the higher discount rate would lead to a less roundabout structure of production (Hayek, 1941).

But the situation discussed now consists of both less savings and, as Mulligan (2006) calls it, *"paradoxically"* more investments. This paradox can graphically be illustrated by the horizontal gap between savings and investments, i.e. the horizontal arrow in the market for loanable funds in Figure 7 below. Also observe that the natural rate, illustrated by the black point in Figure 6, is unaffected by the monetary policy and still at i_{eq}. This is the root of the business cycle theory. Some may argue that the new equilibrium on the loanable fund market would be at the white point, but it's not according to the Austrian theory. Hayek (1935) argues that it would suggest that people saved more and consumed less at the new lower market rate. The Austrian theory suggests that there is disequilibrium on the loanable fund market and that there may be for some time before the market have adjusted (Garrison, 2001). Rothbard (1996) points out that a one-shot credit expansion would have a limited effect on the economy. The wage-earners relatively fast possess their "up bidden" wages, but with unchanged time preferences they save a too small a fraction of it to keep the market rate artificially low and by so doing keeping the new more roundabout production processes profitable. I.e. the boom would hardly be noticed. But, Rothbard (Ibid.) further argues that credit expansions are not one-shot in character, rather it continues over time, keeping the market rate artificially low for as long as credits expand.

To sum up, there is one tendency for a more roundabout structure of production, and one tendency for a less roundabout structure of production. Garrison (2001) shows these opposing tendencies by bending the hypotenuse in the Hayekian triangle, as illustrated in Figure 6. The economy expands beyond the sustainable PPF.

Slightly different, but often complementary, views exist on exactly what will happened in this situation exists. As Hayek (1935) begins his analysis by assuming a full employment equilibrium, one can wonder how it's possible to expand both early and late stages at the same time, and by so doing move beyond the sustainable PPF. Hayek (Ibid.) argues that first there will be an expansion of early stages, accompanied by a reduction of later stages production, but that consumption may continue on the "old" level for a while. Hayek (Ibid., p.267) argues that this will be possible since there still exist highly specific goods in the later stages, which *"will continue to come forward for some little time"*, but further argues that relatively soon scarcity will set upward pressure on consumer prices. This upward pressure on consumer prices is in line with Wicksell (1936 [1898]), who argued that when the market rate is below the natural rate, there will be inflation. If the drop in the interest rate were caused by changed preferences, there would have been an accompanied reduction in consumption. (Hayek, 1935) This voluntary reduction in consumption would then *"serve to bridge the interval of time between the moment when the last products of the old shorter process come onto the market and the moment when the first products of the new longer processes are ready"* (Hayek, 1935, p.267-268). However, wages will be bided up due to the increased demand in the new early stages, and its reasonably that these up bided incomes will fuel the inflation. Due to the faster and faster inflation, caused by scarcity, consumers will possibly spend an even larger *fraction* of their incomes on consumption goods. Finally, Hayek (Ibid.) suggests that these effects causes a return toward the previously less roundabout structure of production since; *"And this rise of the prices of consumers' goods will be the more marked because it is the consequence not only of an increased demand for consumers' goods but an increase in the demand as measured in money." (Hayek, 1935, p.89)*. However, there has been much discussions about time lags, e.g. will nominal wages increase faster or slower than the inflation in consumer prices (Garrison, 2001).

Mises (1998 [1949]) argued that the artificially low market rate, and the following up bided wages, increases demand for consumable goods to such an extent that it leads to a strong tendency toward a less roundabout structure of production. This leads to what some calls "capital consumption", i.e. a reallocation of resources from early to late stages. And Mises

(Ibid.) think this strong tendency will "counterbalance" the "over-investments" in the early stages. This version the Austrian business cycle theory is characterized more by over-consumption than over-investments in the early stages. In one way this is relatively in line with Hayek's (1935, p.89) *"must mean a return to a shorter or less roundabout…"* structure of production. However, Hayek (Ibid.) does possibly seem to believe in some time lag.

Garrison (2001), as have many other, argues that its physically possible to expand both early and late stages of the production at once, and for a while move beyond the sustainable PPF. But it will not be sustainable since its made possibility by such methods as utilize the labor force more intensively, under-maintenance of machines etc., and scarcity will become more and more sever (Garrison, 2004). Mulligan (2006) also describes the situation as if the intermediate stages have become a bottleneck. Once scarcity makes market participants aware of real data, the market will start to reallocate the structure of production to become sustainable, which causes the downturn in output. Some long-term projects, that seemed profitable at the lower market rate are abandoned since they are no longer profitable at the rising costs of scarce resources. Also, later stage activities are abandoned due to rising costs of scarce resources. (Salerno, 2012) Some highly specific equipment will be totally abandoned, while some equipment can be reallocated to a cost (Mulligan, 2006). The recession may be further deepened by lost confidence by the entrepreneurs, whom may increase their liquidity holdings (Salerno, 2012). Mises (1998 [1949]) argues that the increased preference for liquidity are caused by too high prices of the scarce resources, which must decrease relative to consumer prices in order for business to become profitable. This causes the relative price of producers' goods, in terms of consumers goods, to decrease (Salerno, 2012).

How market participants react to changes in prices or the interest rate is critical to this analysis. Elasticity of expectations ($\epsilon_{expectations}$) is critical in this sort of analysis. If $\epsilon_{expectations} = 1$, then the interest rate will continue at the new lower level. If $\epsilon_{expectations} > 1$, it suggests that the interest rate will fall further. If $\epsilon_{expectations} < 1$, it suggests that the interest rate or price will bounce back. Finally, if $\epsilon_{expectations} = 0$, the market will not react to monetary policies at all. But e.g. assuming elasticity of expectations equal to zero, which would ultimately mean that the structure of production does not change due to monetary policies, would not be accurate because market participants cannot instantaneously possess all the required knowledge about underlying realities and causes necessary to take correct decisions. In the Austrian framework market participant can't possibly know exactly how large fraction of the, for the moment, lower*ing* interest rate is due to monetary policy and what may be due to changed preferences.

First after a time-lag can the underlying economic realities be incorporated in expectations. The Austrian school suggest this time-lag to be long enough for booms appear, but short enough not to make changes permanent. (Garrison, 2001)

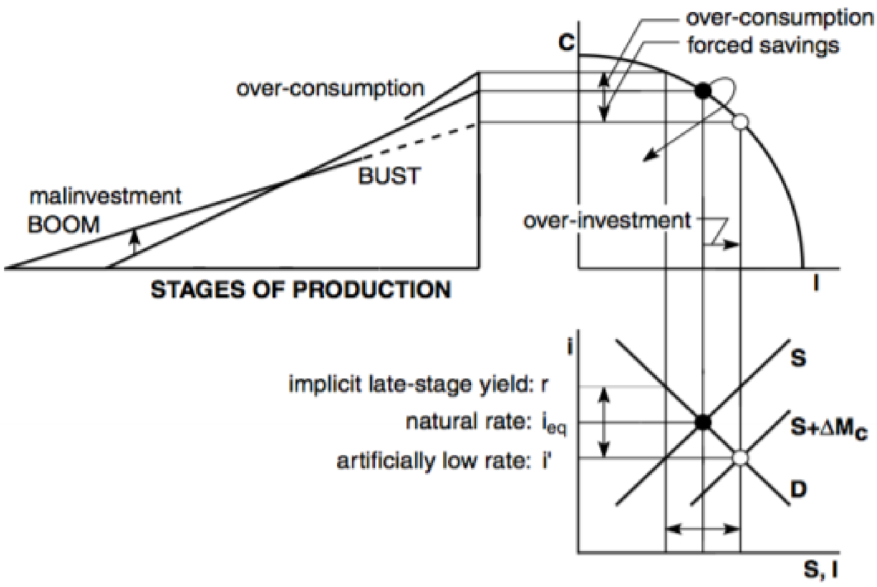


Figure 6. The boom and bust. When the money supply increases it shifts the supply of loanable funds to the right. This lowers the market rate. But what makes this theory distinct is the suggestion that, since consumers time preferences is unchanged, they will consume more, or equivalently save less. There is hence a "distance" on the loanable fund market, illustrated here by the horizontal arrow, between the amount saved and the amount invested. Its assumed that people will save less when the interest rate falls, not more as the white point would suggests. One can think of this in terms of alternative costs, when the interest rate falls, consumption becomes relatively less expensive, vice versa and ceteris paribus. Source: Garrison (2001).

2.4 Null hypothesis of this paper

As should now be clear, the Austrian business cycle theory implies changes in the intertemporal structure of production following monetary policies. The rest of this research revolves around testing the theory by looking at how the Japanese structure of production responds to domestic monetary policies. Looking at Figure 6, we can for example expect late to intermediate prices to increase. At least initially, we can reasonably also expect early to intermediate stages to increase following a looser monetary policy, but the length of this effect, if it arrives, is uncertain. However, a null hypothesis can formally be defined as follows:

> $\mathbf{H_0}$: The Japanese structure of production, as defined by the Austrian capital theory, has been unaffected, as the Austrian business cycle theory suggest it should not be, by domestic monetary policies.

If the null hypothesis is rejected it implies that the monetary policies, conducted by the Bank of Japan, have had some impact on the Japanese structure of production, peculiar to the Austrian business cycle theory.

3. Operationalization

In this chapter the different variables used in the research are treated. First, I describe how fluctuations in the intertemporal structure of production have been captured. Thereafter three “explanatory variables” used to capture the stance of monetary policies is described.

The Austrian business cycle theory implies changes in the structure of production following changing monetary policies. To capture this, I have followed Lester & Wolff (2013) and Cohen & Luther (2014) approach and created four ratios. The first two ratios consist of early and late stage Producer Price Index (PPI), normalized by intermediate stage PPI. Similar ratios have also been calculated using production indexes, with the data described in the chapter 3. The motivation for this kind of normalization is built on the theoretical derived assumption that early stage production and prices expand relatively more than intermediate stages following a credit expansion. The late stages are more uncertain, one can expect prices to increase relative to intermediate stages, but production may or may not increase, depending on what version of the theory is used to explain the fluctuations. But the four ratios will still capture changes in the structure of production, which is particular for the Austrian business cycle theory. These four ratios are supposed to capture changes in the relative prices and production changes between the different stages. The four ratios are defined as follows:

$$EarlyPPI = \frac{Early\ stage\ PPI}{Intermediate\ stage\ PPI}$$

$$LatePPI = \frac{Late\ stage\ PPI}{Intermediate\ stage\ PPI}$$

$$EarlyProd = \frac{Early\ stage\ Production}{Intermediate\ stage\ Production}$$

$$LateProd = \frac{Late\ stage\ Production}{Intermediate\ stage\ Production}$$

One problem with empirical research of the Austrian business cycle theory is that it is built on the unobservable natural rate. The recently most frequently used way of estimate the natural rate (r*) was given by Laubach & Williams (2003). Sudo et.al. (2018) calculated a short-run r* based on the new Keynesian dynamic stochastic general equilibrium model and compared it to several other measures of r* for Japan between 1985 and 2017, this is illustrated in Graph 1. Sudo et.al. (Ibid.) also argues that the potential output growth rate is commonly utilized as an estimate of the natural rate. The different approaches have all a long-run downward trend in common. One drawback with these approaches is that they are dependent on previous macroeconomic data, which is influenced by previous monetary and fiscal policies. These measures of r* may be more useful as tools for monetary policy makers targeting inflation than as estimates of the natural rate in the Austrian theory. Calculating the r* is also outside the scope of this Master I thesis.

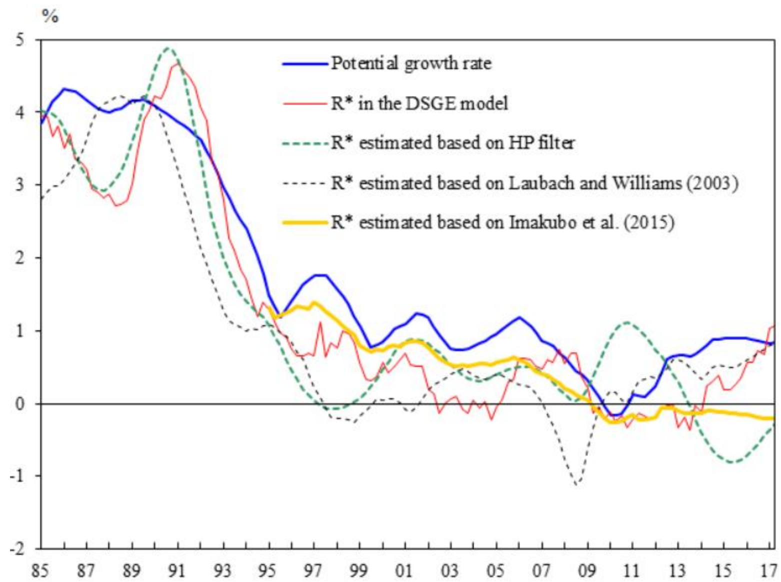


Figure 7. Different measures of the natural rate. As can be seen all estimates of the natural rate built on previous data fluctuates relatively much and have a decreasing trend. Source: Sudo et.al. (2018).

Central bank's policy rate is often considered as a measure of the stance of monetary policies. However, what defines a loose- or tight monetary policy depends on the economic situation. (Bernanke et.al., 2004) Taylor (1993) illustrated that a simple rule could very well explain the actual Federal Fund Rate during the early Greenspan era. The Taylor rate is linear in previous periods inflation and percentual deviation of actual output from potential output. For example, when the inflation rate increases period t, so does the Taylor rate period $t+1$, ceteris paribus. It also changes one for one to changes in the natural rate, r* (Taylor, 1993). Among others, Selgin et.al. (2015) considered the gap between the Federal Fund Rate and the Taylor rate a *"stance"* of the monetary policy. In this research I have followed this thought.

Accordingly, I have further followed Cohen & Luther (2014) and compared what I call the $TaylorGap$ with the structure of production. I have further followed, among others Taylor (1993), and assumed an average natural rate of interest (r^*) of 2 percent, and further a targeted inflation rate of 2 percent. A short-term target "Policy rate" of the Bank of Japan lower than the Taylor rate defines a relatively loose monetary policy, vice versa. A "looser" or "tighter" monetary policy is hence defined in Taylor terms. The explanatory variable is defined as follows:

$$TaylorGap = Policy\,rate - Taylor\,rate$$

Where the Taylor rate is calculated as follows:

$$Taylor\ Rate = r^* + 0.5(\pi_{t-1} - Targeted\ inflation\,rate) + 0.5(Output\ gap_{t-1})$$

$$Where\ \pi\ is\ the\ actual\ inflation\,rate$$

One problem with this variable is that if both the short-term target Policy rate and the Taylor rate changes to the same extent, $TaylorGap$ will be unaffected even though the conditions facing market participants may reasonably be affected by the changed monetary policy. Another problem with this variable is that it can increase for three reasons, a higher Policy rate, a lower inflation or a lower observed output relative to potential output. But nevertheless, it is used to capture the stance of the monetary policy.

Because of the problems associated with the $TaylorGap$ variable, and the fact that I see no very valid way to capture the natural rate that Wicksell (1936 [1898]) defined and the Austrian business cycle theory builds on, as a second explanatory variable the short-term target Policy rate of Japan have been utilized. From here on I will often refer to it as the "Policy rate". The Policy rate is announced by the Bank of Japan as a target for short-term interest rates, and the central bank then conducts market operations to reach this encouraged rate. This may be the most robust explanatory variable in this research.

Luther & Wolff (2013) utilized, among other explanatory variables, money supply M2. Conducting a research of Japanese financial policies, Kuttner & Pose (2001) found that the M2 multiplier had gone down steadily since the early 1990s.

However, as my third explanatory variable the *monetary base* has been utilized. The monetary base is defined as circulating currencies and the total reserves in the financial system. Mishkin (2016) argues that the monetary base is controlled by central banks conduct of open market operations and loans to financial institutions. Mishkin (Ibid.) further argues that the short run fluctuations in the monetary base are relatively predictable and could hence be counteracted by central banks through open market sales and purchases. Kimura (2003) found that the quantitative easing policies in Japan in the early 2000s had a limited effect on the economy because the interest rate was already touching bottom. This makes generalization of the results less credible. The monetary base is put in the natural logarithm to deal with non-stationarity[9]. This explanatory variable is defined as follows:

$$LNMonetaryBase = Natural\ log\ of\ the\ Monetary\ base$$

4. Data

In this chapter the data used in the research, and its origin, is presented.

All data in this paper is secondary in its nature, as it has been collected from the OECD data bank or the Bank of Japan. The data covers February 1983 to December 2017. To capture changes in relative *prices* between the stages of production, what OECD calls "stage of processing" producer price index (PPI) data have been utilized. The indexes are categorized as primary, intermediate and finished goods, where one goods can only be included in one of these three indexes. This differs slightly from Lester & Wolff (2013) and Cohen & Luther (2014) who used what OECD calls "stage of production" index, indexes where the production of one good can be weighted into several indexes. In a complex economy this may seem more relevant, but that kind of indexes was not available for Japan. For example, coal (thought of as an early stage good) can be used as input in early stages of production or to heathen homes of the coal miners themselves, while a hammock (thought of as a late stage good) can be utilized both outside a mine or outside the miner's homes. But nevertheless, I believe that the stage of processing PPI indexes data utilized in this research is relatively satisfying from a theoretically aspect. This may be one source of bias though. Another source of bias is that only industrial

[9] The monetary base time-series was I(2) and the natural log of the monetary base I(1). Since all other variables in this research was I(1) I decided to take the log of monetary base to get all variable in the same order of integration, I(1).

production activities, and not e.g. distribution and service activities, are included in this research.

The indexes for industrial *production* are collected from the Bank of Japan. The production indexes are categorized with respect to “use of goods”. To capture early stage production, only mining activities is used. To capture late stage production, the index “consumer goods” have been utilized. The consumer good production index includes durable- and non-durable consumer goods, i.e. goods for consumers. To capture intermediate stage production the category “Investment goods” have been utilized. The investment good index includes e.g. “capital goods” which includes products not bought by households and who *“have one or more years of an assumed durable term…”,* e.g. different machines and transport equipment. It also includes construction goods, such as building materials and materials for engineering.

Quarterly data for the output gap, measured in percentual deviation from potential output, is downloaded from The Bank of Japan. I have assumed that the percentual output gap in the corresponding three months is each of the same percentage as the quarterly output gap. The method used by the Bank of Japan to calculate the output gap is described by Kawamoto et.al. (2017). The short-term target policy rate is collected from the Bank of Japan. The monthly inflation (CPI) rate for Japan is collected from the OECD data base. Finally, the monetary base data is collected from the Bank of Japan.

Table 1 displays descriptive statistics for the data. In Appendix 7 more descriptive statistics is presented.

Table 1. Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Primary PPI	419	98.80358	6.303292	86.5	126.6
Intermediate PPI	419	96.80358	6.293835	85.9	111.4
Finished PPI	419	115.5169	11.92651	98.5	133.7
Mining prod.	419	91.38831	12.78769	56.4	121.4
Investment good prod.	419	115.7663	19.17222	70	182.6
Consumer good prod.	419	104.6506	9.564161	73.4	127.2
GDP gap	419	-.242506	1.971795	-6.14	5.04
Inflation	419	.6463007	1.28001	-2.5	4.2
Short-term Policy Rate	419	1.417661	1.922465	-.1	6
Monetary base	419	988116.5	1006025	211820	4774490

See Appendix 8 for plotted graphs of the *variables* in levels.

5. Methodology

In this chapter the statistical methods used in the research are treated.

In this research the Vector Autoregression (VAR) approach was decided on because of its simplicity and that the variables are dependent on the previous values. The first step was to decide on the number of lags to include in the model. The rule of thumb when choosing the number of lags is to choose the lowest of different lag selection criteria's (Greene, 2012). For the models in this research Hannan and Quinn information criterion, Akaike information criterion and Final Prediction Error suggests 13 lags. Using too may lags can reduce the degree of freedom and cause problems with multicollinearity (Gujarati & Porter, 2009), and using too few lags can cause problems with autocorrelation (McMillin & Ozcicek, 1999). Lester & Wolff's (2013) and Cohen & Luther's (2014) very similar studies of the Austrian business cycle theory used 12 lags. Lester & Wolff's (2013) argues that 12 lags follow the prevailing agenda in monetary doctrines. However, after empirical elaboration in Stata, it was found that with 12 lags the following Johansen test implied cointegration among the time-series. This meant that the VECM[10] approach, which also estimates long-run relationships, instead of the VAR[11] approach could be utilized. When its recognized that business cycles can be relatively long, this approach may seem more appropriate. But, after performing Lagrange multiplier tests for serial autocorrelation it was further found that all VEC models suffered from autocorrelation, which is a sign of misspecification (Greene, 2012). In this case, many argues that one should increase the lag length. When instead using the suggested 13 lags, no cointegration were found. Running VAR(13) models showed similar results to those of the VEC(12) models but the problems with autocorrelation were almost gone. In chapter 6 I have chosen to display and analyse the results from both approaches.

Sims (1980) laid out the VAR approach which according to, among others, Stock & Watson (2001) have proved to be a good tool for describing and forecasting macroeconomic data. Stock & Watson (Ibid.) describes three types of VAR approaches. The one utilized in this research is defined as a "reduced form VAR" (Stata, 2019). In the reduced form VAR each variable is a linear function of its lagged values, the lagged values of the other endogenous variables, and

[10] Vector Error Correction Model. Sometimes also written as the "VEC model".
[11] Vector Autoregression.

the error term within the model. The equations are calculated by the ordinary least square (OLS) procedure (Stock & Watson, 2001).

5.1 Stationarity

Many macroeconomic time-series variables are non-stationary (Greene, 2012). They can be random walks with or without trends and/or drift. Non-stationary data may contain unit roots and is, most often, integrated of order one, denoted I(1). I(1) series can usually be transformed to stationary time-series by taking their first difference. Non-stationary variables are often problematic and can e.g. result in seemingly high correlations and a shock to the innovation in the model may further have permanent effects. Regressions with non-stationary time series will lack the white noise. To test for stationarity, Augmented Dickey-Fuller (ADF) tests can be carried out. (Greene, 2012) The ADF test is based on the equation (Stata, 2019):

$$\Delta y_t = \alpha + \beta y_{t-1} + \delta t + \sum_{j=1}^{k} \zeta j \Delta y_{t-j} + \epsilon_t$$

Where k is the, by the researcher, specified lag length. α is a constant term and δ is a drift term. Furthermore, when as in the standard case, α and δt are both omitted, Stata (Ibid.) defines the test statistics formula as follows:

$$Z_t = \frac{\hat{\beta}}{\hat{\sigma}_\beta}$$

Where the null hypothesis in the test is: $H_0\colon \beta = 0 \Leftrightarrow H_0\colon y_t$ *follows a random walk without drift*.

As seen in Table 1 below, the augmented Dickey-Fuller tests performed in Stata shows that all time-series in this research are I(1), or "stationary in their first differences". When the absolute value of the T statistic is larger than the 5 percent critical value, I have declared the variable as stationary. Since the H_0 is rejected for all variables in there first difference none of them are I(2). If a trend is imposed in the ADF test, we can test the H_0 *that the variable follows a random walk with or without drift*, whereof we could detect if some variable is *trend-stationary*. If a drift term is included in the ADF the H_0 *that the variable follows a random walk with drift* is tested. One can distinguishing between difference-stationary and trend-stationary. Differentiate trend-stationary variables to make them stationary, called "over-differentiating", may cause problems, whereof detrending is preferred (Gujarati, 2011). ADF tests in Stata, with trend or drift included in some tests, suggest that none of the variables are trend-stationary, they all seem to be first difference-stationary, or "integrated of order one". In the remaining research all variables are assumed to be I(1).

Table 2. Augmented Dickey-Fuller Tests with 12 Lags

Variable		Level T statistic	First difference (Δ) T statistic	5% Critical Value
EarlyPPI		-2.704	-7.079	-2.874
LatePPI	(drift)	-0.642	-3.934	-1.649
EarlyProd	(drift)	-0.944	-5.184	-1.649
LateProd		-2.171	-4.394	-2.874
TaylorGap		-2.315	-6.536	-2.874
LNMonetaryBase	(trend)	-1.355	-3.403	-3.324
PolicyRate		-2.609	-6.409	-2.874

"Level" means the variable in its raw form and "First difference" means that the variable has been differentiated once. The parentheses shows what options are included in the ADF test.

Table 3. Augmented Dickey-Fuller Tests with 13 Lags

Variable		Level T statistic	First difference (Δ) T statistic	5% Critical Value
EarlyPPI		-2.300	-6.156	-2.874
LatePPI	(drift)	-0.479	-4.115	-1.649
EarlyProd	(drift)	-0.868	-5.766	-1.649
LateProd		-2.378	-4.193	-2.874
TaylorGap		-2.315	-6.536	-2.874
LNMonetaryBase	(trend)	0.557	-3.021	-1.649
PolicyRate		-2.565	-6.410	-2.874

"Level" means the variable in its raw form and "First difference" means that the variable has been differentiated once. The parentheses shows what options are included in the ADF test.

There has further been a debate whether or not one should run VARs with non-stationary data. Transformed data may lose their dynamics, whereof many VAR conductors estimates their VARs in levels, with I(1) time-series (Harvey, 1990), and many other researchers also argues that performing the VARs in levels with I(1) series results in "super consistent" results. But estimating VARs in levels with I(1) can also cause spurious regressions (Greene, 2012). However, the VAR(13) estimations presented in chapter 6 are estimated in levels, after confirming that they are all I(1) and there are no cointegration, see next chapter.

5.2 Cointegration

It is possible that time-series, which are individually I(1), when linearly combined with other I(1) time-series, will be I(0). This means that the time-series are drifting together at approximately the same rate. Series with this characteristic are said to be cointegrated (Greene, 2012). When there is cointegration among the time-series, we can as Greene (2012) mentions, distinguish between short-run and long-run relationships, and differencing to make cointegrated time-series stationary would conceal long-run relationships. In this research Johansen tests have been utilized to discover cointegration among the time-series. The Johansen test derives two statistics to find the cointegration "rank", Trace- and Max statistics. (Asari et.al., 2011). Asari et.al. (Ibid.) argues that when faced with different result from Trace- and Max statistics, the Trace statistic is preferred.

Since there are three explanatory variables, and hence three different regression models to estimate in this research, three Johansen tests have been performed. In Table 4-6 below the parentheses consist of the 5 percent critical values. If the corresponding statistic is larger than the 5 percent critical value I have rejected the null hypothesis. As can be seen in Table 4, with the TaylorGap, Trace statistic suggest a maximum rank of two, while Max statistic implies a maximum rank of one. I have chosen to follow the Trace statistic and assumed two cointegration equations. As further displayed in Table 3 and 4, Trace- and Max statistics both suggest a maximum rank of one for both regression models.

Table 4. Johansen test for cointegration with TaylorGap and 12 lags

Rank	Parameters	LL	Eigenvalue	Trace statistic	Max statistic
0	280	5026.8599	.	92.0114 (68.52)	44.1778 (33.46)
1	289	5048.9487	0.10286	47.8336 (47.21)	24.7548*(27.07)
2	296	5061.3262	0.05901	23.0788*(29.68)	13.0359 (20.97)
3	301	5067.8441	0.03152	10.0429 (15.41)	10.0409 (14.07)
4	304	5072.8646	0.02437	0.0020 (3.76)	0.0020 (3.76)
5	305	5072.8656	0.00000		

H_0: No cointegration equation.

Table 5. Johansen test for cointegration with LNMonetaryBase and 12 lags

Rank	Parameters	LL	Eigenvalue	Trace statistic	Max statistic
0	280	6188.4058	.	82.9061 (68.52)	37.1759 (33.46)
1	289	6206.9938	0.08729	45.7302* (47.21)	19.2620*(27.07)
2	296	6216.6248	0.04622	26.4682 (29.68)	11.9974 (20.97)
3	301	6222.6235	0.02905	14.4708 (15.41)	11.3501 (14.07)
4	304	6228.2985	0.02750	3.1207 (3.76)	3.1207 (3.76)
5	305	6229.8589	0.00764		

H_0: No cointegration equation.

Table 6. Johansen test for cointegration with Policy rate and 12 lags

Rank	Parameters	LL	Eigenvalue	Trace statistic	Max statistic
0	280	5084.2547	.	81.5640 (68.52)	36.7322 (33.46)
1	289	5102.6208	0.08630	44.8317* (47.21)	18.7186*(27.07)
2	296	5111.9801	0.04495	26.1131 (29.68)	14.7431 (20.97)
3	301	5119.3517	0.03558	11.3700 (15.41)	11.1890 (14.07)
4	304	5124.9461	0.02712	0.1810 (3.76)	0.1810 (3.76)

5	305	5125.0367	0.00044

H_0: No cointegration equation.

That cointegration was found among the time-series suggest that there are some long-run relationships among them. Since with 12 lags cointegration were found in all of the three models, the VECM approach instead of the VAR approach could be utilized. Running a VAR in first differences with all time-series I(1) and cointegration among the time-series would only express short-run responses of shocks to the innovations (Baum, 2013), and Greene (2012) further argues that differentiating to make these cointegrated time-series stationary would hide long-run relationships. Baum (Ibid.) suggest estimating VEC models (VECM) if cointegration is found.

Table 7. Johansen test for cointegration with TaylorGap and 13 lags

Rank	Parameters	LL	Eigenvalue	T statistic	Max-statistic
0	305	5155.8536	.	61.7837*(68.52)	28.4877*(33.46)
1	314	5170.0974	0.06776	33.2960 (47.21)	14.3951 (27.07)
2	321	5177.2949	0.03483	18.9010 (29.68)	10.1887 (20.97)
3	326	5182.3893	0.02478	8.7122 (15.41)	8.4491 (14.07)
4	329	5186.6138	0.02060	0.2631 (3.76)	0.2631 (3.76)
5	330	5186.7454	0.00065		

H_0: No cointegration equation.

Table 8. Johansen test for cointegration with LNMonetaryBase and 13 lags

Rank	Parameters	LL	Eigenvalue	T statistic	Max-statistic
0	305	6306.3909	.	61.2476*(68.52)	29.0505*(33.46)
1	314	6320.9162	0.06905	32.1970 (47.21)	12.6280 (27.07)
2	321	6327.2302	0.03062	19.5690 (29.68)	12.0426 (20.97)
3	326	6333.2515	0.02923	7.5264 (15.41)	4.4173 (14.07)
4	329	6335.4602	0.01082	3.1090 (3.76)	3.1090 (3.76)
5	330	6337.0147	0.00763		

H_0: No cointegration equation.

Table 9. Johansen test for cointegration with Policy rate and 13 lags

Rank	Parameters	LL	Eigenvalue	T-statistic	Max-statistic
0	305	5228.3455		56.5356*(68.52)	22.7865*(33.46)
1	314	5239.7388	0.05458	33.7491 (47.21)	15.4525 (27.07)
2	321	5247.465	0.03735	18.2966 (29.68)	11.2435 (20.97)
3	326	5253.0867	0.02731	7.0532 (15.41)	6.8505 (14.07)
4	329	5256.512	0.01673	0.2026 (3.76)	0.2026 (3.76)
5	330	5256.6133	0.00050		

H_0: No cointegration equation.

As displayed in Table 7-9, with 13 lags, the Johansen test implies no cointegration among the variables.

5.3 Impulse Response Functions

Since the coefficients in VAR and VEC models isn't straightforward to interpret, Impulse Response Functions (IRFs) have been used. The IRF estimates the effects of a shock in one endogenous variable on itself or the other variables in the model (Baum, 2014). Stata does this by impulses, or exogenous shocks, to the innovation term in the corresponding equation within the VAR or VEC model, and then traces out the effects on the other endogenous variables (Stata, 2016). To generalize the time lags and magnitudes in the IRFs to the real world is hard since it's not reasonably that the stance of monetary policies behaves as one-time shocks. Nevertheless, the signs of the responses are of concern in the current research.

Baum (2014) argues that to estimate IRFs, the underlying VAR or VEC model must be stable. If all modulus of all eigenvalue in the companion matrix is less than one, the model can be defined as stable (Stata, 2019). When testing for stability it was found that none of the estimated VEC models was stable. This motivated the choice to utilize Orthogonalized Impulse Response Functions (OIRFs). Regarding the VAR models all but the one with the log of the monetary base as the explanatory variable were found stable, whereof IRFs are estimated in those cases. The shocks performed in Stata are of a positive one standard deviation for OIRFs and of a positive one-unit for the IRFs (Sánchez, 2011).

Since the size of the shock for all the VEC models is one standard deviation, we cannot interpret the shocks as 100 base points shocks, which can be done for the IRFs with the Policy rate. This makes the results of the OIRF results less comparable with the findings of Lester & Wolff (2013) and Cohen & Luther (2014) who used one 100 base-point shocks. But the Austrian business cycle theory suggest that the relative sizes between countries may depend on how the marginal curves looks in different stages, which will reasonably differ between the US and Japan. My point is that magnitudes are of subordinated interest in this research. IRF have further been utilized by among others Mulligan (2006) who found that a decrease in the Yield spread reduced real consumable output. Small samples may cause biased IRFs estimates with biased confidence intervals (Ronayne, 2011).

5.4 Granger Causality

A Granger causality test is carried out to see if the lagged values of one variable helps to explain the other variable. If $f\left(x_t \middle| x_{t-1}, y_{t-1}\right)$ is equal to $f(x_t | x_{t-1})$, the lagged values of the variable Y do not help to explain the variable X, i.e. Y does not Granger cause X (Greene, 2012). The null hypotheses in this paper is that Y does not Granger cause X. X and Y are here synonyms for two time-series. If X is found to Granger cause Y, and Y is found to Granger cause X, we say that there exists bidirectional causality. If one of the two null hypotheses are rejected only, we say that there exists unidirectional causality. If we fail to reject both null hypotheses, we say that there exist no Granger casual relationships. (Asari et.al., 2011)

If the "adjustment term" in the VEC model is significant it reveals long-run causality. However, VEC and VAR based Granger "Wald" tests for "short-run causality" are carried out, the results are presented in chapter 6.

5.5 Diagnostics

Its common that the disturbances, or "innovations", in time-series data are autocorrelated. Autocorrelation implies that the knowledge of the disturbance one period will help to guess the disturbance next period. This may be due to misspecification of the model, e.g. when relevant variables which are also correlated over time are omitted from the model (Greene, 2012). In economic research one cannot include all relevant variables, and variables often depends on other variables. The error term is supposed to capture the omitted variables in a model. These omitted variables can be correlated and result in autocorrelation in our model. To test for serial autocorrelation the Lagrange multiplier (LM) test can be utilized. (Greene, 2012)

Stata (2019) calculates the LM statistics as follows:

$$LM_s = (\mathrm{T} - \mathrm{d} - 0.5)\ln\left(\frac{|\hat{\Sigma}|}{|\widetilde{\Sigma_s}|}\right)$$

Where T equals the number of observations, d equals the number of estimated coefficients, Σ is the variance–covariance matrix of the innovations, $\hat{\Sigma}$ is the maximum likelihood estimation of Σ from the VAR, $\widetilde{\Sigma_s}$ is the maximum likelihood estimation of Σ, for the augmented VAR[12]. The Chi-Squared generated by Stata is the asymptotic distribution of this statistics, and we can reject the H_0 of no autocorrelation if the corresponding p-value is significant. (Stata, 2019) In this research, the test for serial autocorrelation is used to diagnose the estimated regression model. Gujarati & Porter (2009) argues that the OLS estimated coefficients are still unbiased in the case of autocorrelation, but further argues that in many cases it leads to more significant

[12] See Stata syntax "varlmar" for further explanation of the augmented VAR.

coefficients. Problems with autocorrelation is commonly dealt with by increasing the number of lags.

If the error terms have zero mean and constant variance, they are defined as normally distributed (Greene, 2012). According to Stata (2019), non-normally distributed residuals indicates a less valid regression model. Nevertheless, it does not usually mean that the estimated coefficients are biased, they are still the "*Best Linear Unbiased Estimators"*, but e.g. tests statistics and confidence intervals may be biased, depending on sample size (Gujarati & Porter, 2009, p.129; Greene, 2012). One way to correct for non-normality is to include dummy variables. But this is a controversial way to improve the regression results (Bath University, 2012). However, no dummy variables are utilized in this research. To test for normality of the residuals the Jarque-Bera test have been carried out. The Jarque-Bera test statistic is the sum of kurtosis and skewness statistics[13]. Normality of the residuals is a sign of a valid model (Lutz & Demiroglu, 2000), but not a necessary condition (Greene, 2012).

All estimations are carried out in Stata. The steps have been as follows:

- Determine the lag length.
- Augmented Dickey-Fuller test.
- Johansen test for cointegration between the series.
- Estimate the VEC models.
- Tested for stability.
- Orthogonalized Impulse Response Functions.
- Granger Causality tests.
- Diagnostics.
- Same procedure, but with 13 lags and VAR approach.

[13] The mathematical explanation is too long to give here. See Lutkepohl (2005, p.174–181) for the mathematical deduction of the test (Stata, 2019).

5.6 VEC model specification

$$\Delta EarlyPPI_t = \sigma_1 + \sum_{i=1}^{11} \beta_{1i} \Delta EarlyPPI_{t-i} + \sum_{j=1}^{11} \delta_{1j} \Delta LatePPI_{t-j} + \sum_{k=1}^{11} \theta_{1k} \Delta EarlyProd_{t-k} + \sum_{l=1}^{11} \varphi_{1l} \Delta LateProd_{t-l} + \sum_{m=1}^{11} \phi_{1m} \Delta Expl.Variable_{t-m} + \lambda_1 ECT_{t-1} + u_{1t}$$

Where:

$$ECT_{t-1} = EarlyPPI_{t-1} + \delta_{1j} LatePPI_{t-1} + \theta_{1k} EarlyProd_{t-1} + \varphi_{1l} LateProd_{t-1} + \phi_{1m} Expl.Variable_{t-1}$$

$$\Delta LatePPI_t = \sigma_2 + \sum_{i=1}^{11} \beta_{2i} \Delta EarlyPPI_{t-i} + \sum_{j=1}^{11} \delta_{2j} \Delta LatePPI_{t-j} + \sum_{k=1}^{11} \theta_{2k} \Delta EarlyProd_{t-k} + \sum_{l=1}^{11} \varphi_{2l} \Delta LateProd_{t-l} + \sum_{m=1}^{11} \phi_{2m} \Delta Expl.Variable_{t-m} + \lambda_2 ECT_{t-1} + u_{2t}$$

Where:

$$ECT_{t-1} = LatePPI_{t-j} + \beta_{2i} EarlyPPI_{t-1} + \theta_{2k} EarlyProd_{t-1} + \varphi_{2l} LateProd_{t-1} + \phi_{2m} Expl.Variable_{t-1}$$

$$\Delta EarlyProd_t = \sigma_3 + \sum_{i=1}^{11} \beta_{3i} \Delta EarlyPPI_{t-i} + \sum_{j=1}^{11} \delta_{3j} \Delta LatePPI_{t-j} + \sum_{k=1}^{11} \theta_{3k} \Delta EarlyProd_{t-k} + \sum_{l=1}^{11} \varphi_{3l} \Delta LateProd_{t-l} + \sum_{m=1}^{11} \phi_{3m} \Delta Expl.Variable_{t-m} + \lambda_3 ECT_{t-1} + u_{3t}$$

Where:

$$ECT_{t-1} = EarlyProd_{t-1} + \beta_{3i} EarlyPPI_{t-1} + \delta_{3j} LatePPI_{t-1} + \varphi_{3l} LateProd_{t-1} + \phi_{3m} Expl.Variable_{t-1}$$

$$\Delta LateProd_t = \sigma_4 + \sum_{i=1}^{11} \beta_{4i} \Delta EarlyPPI_{t-i} + \sum_{j=1}^{11} \delta_{4j} \Delta LatePPI_{t-j} + \sum_{k=1}^{11} \theta_{4k} \Delta EarlyPI_{t-k} + \sum_{l=1}^{11} \varphi_{4l} \Delta LatePI_{t-l} + \sum_{m=1}^{11} \phi_{4m} \Delta Expl.Variable_{t-m} + \lambda_4 ECT_{t-1} + u_{4t}$$

Where:

$$ECT_{t-1} = LateProd_{t-1} + \beta_{4i} EarlyPPI_{t-1} + \delta_{4j} LatePPI_{t-1} + \theta_{4k} EarlyProd_{t-1} + \phi_{4m} Expl.Variable_{t-1}$$

$$\Delta Expl.Variable_t = \sigma_5 + \sum_{i=1}^{11} \beta_{5i} \Delta EarlyPPI_{t-i} + \sum_{j=1}^{11} \delta_{5j} \Delta LatePPI_{t-j} + \sum_{k=1}^{11} \theta_{5k} \Delta EarlyProd_{t-k} + \sum_{l=1}^{11} \varphi_{5l} \Delta LateProd_{t-l} + \sum_{m=1}^{11} \phi_{5m} \Delta Expl.Variable_{t-m} + \lambda_5 ECT_{t-1} + u_{5t}$$

Where:

$$ECT_{t-1} = Expl.Variable_{t-1} + \beta_{5i} EarlyPPI_{t-1} + \delta_{5j} LatePPI_{t-1} + \theta_{5k} EarlyProd_{t-1} + \varphi_{5l} LateProd_{t-1}$$

In these equations u_{it} are white noise error terms, or "innovations" (Gujarati, 2011). β_{ii}, δ_{ij}, θ_{ik}, φ_{il}, and ϕ_{im} outside the ECT terms are the short-term coefficients. λ_i is the adjustment terms. σ_i are constants, or intercepts. The βi_i, δ_{ij}, θ_{ik}, φ_{il}, and ϕ_{im} in the ECM terms is the long-run coefficients. The lambda coefficients, λ_i, or "adjustments terms", can be interpreted as the speed of adjustment to which previously months deviation from the long run equilibrium is corrected for within the current month. t stands for time. There are further 12 minus 1 lags in the model.

$Expl.Variable$ is a synonym for either $TaylorGap$, $LNMonetryBase$ or the Policy rate. Five different VEC models are estimated, one model with each explanatory variable. The coefficients of primary interest for the current analysis is the ϕ_{im} and λ_i and the in the first four equations.

5.7 VAR model specification

$$EarlyPPI_t = \sigma_1 + \sum_{i=1}^{13} \beta_{1i} EarlyPPI_{t-i} + \sum_{j=1}^{13} \delta_{1j} LatePPI_{t-j} + \sum_{k=1}^{13} \theta_{1k} EarlyProd_{t-k} + \sum_{l=1}^{13} \varphi_{1l} LateProd_{t-l} + \sum_{m=1}^{13} \phi_{1m} Expl.Variable_{t-m} + u_{1t}$$

$$LatePPI_t = \sigma_2 + \sum_{i=1}^{13} \beta_{2i} EarlyPPI_{t-i} + \sum_{j=1}^{13} \delta_{2j} LatePPI_{t-j} + \sum_{k=1}^{13} \theta_{2k} EarlyProd_{t-k} + \sum_{l=1}^{13} \varphi_{2l} LateProd_{t-l} + \sum_{m=1}^{13} \phi_{2m} Expl.Variable_{t-m} + u_{2t}$$

$$EarlyProd_t = \sigma_3 + \sum_{i=1}^{13} \beta_{3i} EarlyPPI_{t-i} + \sum_{j=1}^{13} \delta_{3j} LatePPI_{t-j} + \sum_{k=1}^{13} \theta_{3k} EarlyProd_{t-k} + \sum_{l=1}^{13} \varphi_{3l} LateProd_{t-l} + \sum_{m=1}^{13} \phi_{3m} Expl.Variable_{t-m} + u_{3t}$$

$$LateProd_t = \sigma_4 + \sum_{i=1}^{13} \beta_{4i} EarlyPPI_{t-i} + \sum_{j=1}^{13} \delta_{4j} LatePPI_{t-j} + \sum_{k=1}^{13} \theta_{4k} EarlyPI_{t-k} + \sum_{l=1}^{13} \varphi_{4l} LatePI_{t-l} + \sum_{m=1}^{13} \phi_{4m} Expl.Variable_{t-m} + u_{4t}$$

$$Expl.Variable_t = \sigma_5 + \sum_{i=1}^{13} \beta_{5i} EarlyPPI_{t-i} + \sum_{j=1}^{13} \delta_{5j} LatePPI_{t-j} + \sum_{k=1}^{13} \theta_{5k} EarlyProd_{t-k} + \sum_{l=1}^{13} \varphi_{5l} LateProd_{t-l} + \sum_{m=1}^{13} \phi_{5m} Expl.Variable_{t-m} + u_{5t}$$

In this VAR(13) model, the ϕ_{im} coefficients in the first four equations are those of primary concern in this research. σ_i are the intercept and the last terms are the innovations.

6. Result & Analysis

This chapter is composed of three parts, one part for each explanatory variable. I have chosen to report both the VECM and VAR results in this chapter. Only the coefficients of primary interest are presented here, see Appendix 1-6 for complete regression results and summary statistics.

6.1.1 VEC model with TaylorGap

Table 10.

Long-run coefficients

beta	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ce1						
TaylorGap	.2964393	.0534572	5.55	0.000	.1916652	.4012135
Constant	2.818086					
ce2						
TaylorGap	-.2051537	.0575572	-3.56	0.000	-.3179637	-.0923437
Constant	-5.034846					

Short-run coefficients

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ΔEarlyPPI						
ce1						
λ_1	.0126913	.0070253	1.81	0.071	-.001078	.0264607
ce2						
λ_1	.013692	.0072712	1.88	0.060	-.0005593	.0279433
TaylorGap						
LD.	.0002648	.0020122	0.13	0.895	-.003679	.0042086
L2D.	-.0015628	.0019723	-0.79	0.428	-.0054285	.0023029
L3D.	-.0034968	.0019944	-1.75	0.080	-.0074057	.0004121
L4D.	-.0022178	.0019926	-1.11	0.266	-.0061231	.0016876
L5D.	.00025	.0019925	0.13	0.900	-.0036552	.0041553
L6D.	-.0018218	.0020092	-0.91	0.365	-.0057597	.0021161
L7D.	.0002632	.0020103	0.13	0.896	-.003677	.0042033
L8D.	.0010434	.0019954	0.52	0.601	-.0028675	.0049543
L9D.	.0008492	.0019747	0.43	0.667	-.0030211	.0047194
L10D.	.0003101	.0019565	0.16	0.874	-.0035246	.0041448
L11D.	.0002989	.0018865	0.16	0.874	-.0033986	.0039963
Constant	.0003706	.0005473	0.68	0.498	-.000702	.0014432
ΔLatePPI						
ce1						
λ_2	-.0068547	.0027428	-2.50	0.012	-.0122304	-.001479
ce2						
λ_2	-.0075465	.0028388	-2.66	0.008	-.0131104	-.0019826
TaylorGap						
LD.	.0004177	.0007856	0.53	0.595	-.0011221	.0019574
L2D.	.0006861	.00077	0.89	0.373	-.0008231	.0021953
L3D.	.0011813	.0007786	1.52	0.129	-.0003447	.0027074
L4D.	-.0002007	.0007779	-0.26	0.796	-.0017254	.001324
L5D.	.0002757	.0007779	0.35	0.723	-.001249	.0018003
L6D.	-.0009588	.0007844	-1.22	0.222	-.0024963	.0005786
L7D.	-.0005225	.0007849	-0.67	0.506	-.0020608	.0010158

L8D.	.0002713	.000779	0.35	0.728	-.0012556	.0017981
L9D.	.0001558	.0007709	0.20	0.840	-.0013552	.0016668
L10D.	.0001302	.0007638	0.17	0.865	-.001367	.0016273
L11D.	-.0004761	.0007365	-0.65	0.518	-.0019197	.0009674
Constant	.0000977	.0002137	0.46	0.648	-.0003211	.0005164
ΔEarlyProd						
ce1						
λ_3	-.0384691	.0160129	-2.40	0.016	-.0698538	-.0070845
ce2						
λ_3	-.0142171	.0165734	-0.86	0.391	-.0467003	.0182661
TaylorGap						
LD.	.001374	.0045864	0.30	0.764	-.0076152	.0103633
L2D.	.0016905	.0044955	0.38	0.707	-.0071205	.0105016
L3D.	.0068998	.0045458	1.52	0.129	-.0020098	.0158094
L4D.	.0058334	.0045417	1.28	0.199	-.0030681	.014735
L5D.	.0176004	.0045415	3.88	0.000	.0086992	.0265017
L6D.	.0098975	.0045796	2.16	0.031	.0009217	.0188733
L7D.	.0188986	.0045821	4.12	0.000	.0099178	.0278794
L8D.	.0151723	.0045481	3.34	0.001	.0062581	.0240864
L9D.	.0119055	.0045009	2.65	0.008	.0030839	.0207271
L10D.	.0062339	.0044595	1.40	0.162	-.0025065	.0149744
L11D.	.0092306	.0042999	2.15	0.032	.0008029	.0176583
Constant	.003375	.0012474	2.71	0.007	.0009302	.0058198
ΔLateProd						
ce1						
λ_4	-.0663724	.0210087	-3.16	0.002	-.1075487	-.0251961
ce2						
λ_4	-.0607817	.0217441	-2.80	0.005	-.1033993	-.018164
TaylorGap						
LD.	.0015806	.0060174	0.26	0.793	-.0102132	.0133744
L2D.	.0156235	.0058981	2.65	0.008	.0040635	.0271835
L3D.	.0109379	.005964	1.83	0.067	-.0007514	.0226272
L4D.	.0117574	.0059586	1.97	0.048	.0000786	.0234361
L5D.	.0246332	.0059585	4.13	0.000	.0129548	.0363115
L6D.	.0159734	.0060083	2.66	0.008	.0041973	.0277495
L7D.	.0152518	.0060117	2.54	0.011	.003469	.0270345
L8D.	.0191651	.0059671	3.21	0.001	.0074698	.0308604
L9D.	.0226534	.0059051	3.84	0.000	.0110796	.0342273
L10D.	.0158836	.0058508	2.71	0.007	.0044162	.027351
L11D.	.0171678	.0056415	3.04	0.002	.0061107	.0282249
Constant	.0053143	.0016365	3.25	0.001	.0021067	.0085218

Table 10 displays the result from the VECM estimation with $TalyorGap$ as the explanatory variable. Here the "Constant" terms are equivalent to the σ_i terms in the model specification, i.e. the intercepts.

Both long-run coefficients of interest are significant on a 1-percentage level, but their signs are opposite. Since their signs are opposed, it makes interpretation complicated. For both long run coefficients, the upper- and lower bond of the 95 percent confidence intervals are of the same sign.

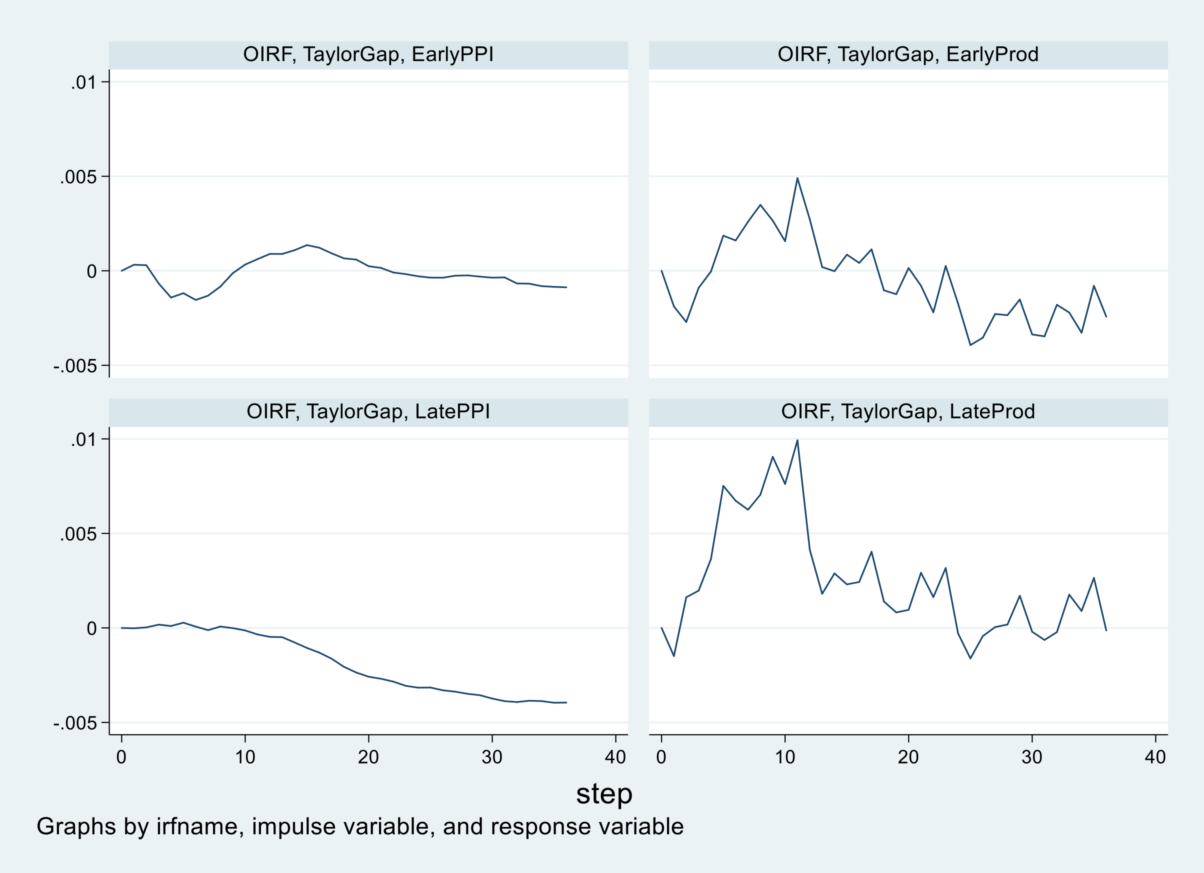
The adjustment terms found are positive for $EarlyPPI$ which suggest that there may be structural changes in the data. For $LatePPI$ and the two production ratios, the adjustment terms are negative, and all, except λ_3 for the second cointegration equation (ce2) in $\Delta EarlyProd$, are significant at a 5-percentage level. To sum, this implies long-run relationships between the TaylorGap and $LatePPI$, $EarlyProd$ and $LateProd$.

As displayed in Table 6, most short-run coefficients are not significant at a 5-percentage level. But Gujarati & Porter (2009, p.785) also mentions that *"with several lags of the same variables, each estimated coefficient will not be statistically significant, possibly because of multicollinearity"*. For $LateProd$, most short-run coefficients are significant at a 5-percentage level though. Noteworthy is that both the upper- and lower bond of the 95 percent confidence intervals are positive.

The short-run coefficients are also relatively modest, but magnitudes are as mentioned of subordinate concern in this analysis. The most noteworthy in Table 10 is that the sign of the short-run coefficients for the two production ratios are opposite to what the conventional theory implied. As seen in Appendix 1, R-squared is relatively high for the production equations.

Looking at the 95 percent confidence intervals for the short-run coefficients of the two price ratios, we see that the upper- and lower bonds have for the most opposite signs.

Graph 1. Orthogonalized Impulse Response Function



Graph 1. The Orthogonalized Impulse Response Functions with TaylorGap as the impulse variable. The graphs show the response of the four ratios derived from a positive one standard deviation impulse in the TaylorGap.

The OIRFs in Graph 1 displays the responses in the four ratios from a positive one standard deviation shock in the $TaylorGap$. It can be interpreted as a tighter monetary policy in Taylor terms. The effect of a looser policy is then the mirrored. As seen in Graph 1, a positive shock leads to an initial decline in $EarlyPPI$. This can be interpreted as when the policy maker tightens their monetary policies in Taylor terms, early to intermediate stage prices first decreases but relatively soon increases and later converge toward zero. Or equivalently, if the policy maker *loosens* their monetary policies in Taylor terms, early to intermediate prices initially increases but falls back relatively quickly and later converging toward zero. However, the response graph evolves around zero, whereof deeper interpretation is wasted. The other graphs are interpreted in similar ways.

Following a looser monetary policy, $EarlyProd$ initially increases, but quickly decreases. After about one year, $EarlyProd$ is lower than before, but after about two years its higher than before. Since it fluctuates around zero it’s no meaning of interpreting this from a theoretical prospect. However, the initial increase and the latter decline is relatively in line with Mises et.al. version of the theory.

$LateProd$ increases and is about 1 percent higher than initially after about 10 months following a tighter monetary policy. After this it converges. This is opposed to what the Austrian business cycle theory implies.

The $TaylorGap$ variable can increase not only if the Policy rate increases, but also if either the inflation is lowered in the previous period, or if actual output decreases compared to potential output in the previous period. Lower inflation could, *ceteris paribus*, mean a higher real rate. But the Bank of Japan targeting a 2 percent inflation, which implies a lower Policy rate when inflation is lower. However, to answer which of, and too what extent, the three variables within the $TaylorGap$ the orthogonalized impulse responses “captures” is just too difficult. All we can interpret the impulses as is a tighter monetary policy in Taylor terms.

The only response in Graph 1 that is obviously in line with the Austrian business cycle theory is the response in $LatePPI$, which increases when the monetary policy is loosened in Taylor terms. When the monetary policy is loosened people may reasonably consume more, leading to a positive demand derived effect, which according to the theory causes the observed outcome.

Table 11. Granger Wald Causality test with TaylorGap

H_0	chi2	Prob > chi2	
TaylorGap do not Granger cause EarlyPPI	0.02	0.8953	Fail to reject
TaylorGap do not Granger cause LatePPI	0.28	0.5950	Fail to reject
TaylorGap do not Granger cause EarlyProd	0.09	0.7645	Fail to reject
TaylorGap do not Granger cause LateProd	0.07	0.7928	Fail to reject
EarlyPPI do not Granger cause TaylorGap	0.11	0.7403	Fail to reject
LatePPI do not Granger cause TaylorGap	1.20	0.2737	Fail to reject
EarlyProd do not Granger cause TaylorGap	0.22	0.6368	Fail to reject
LateProd do not Granger cause TaylorGap	1.80	0.1795	Fail to reject

In Table 11 we can reject the null hypothesis if the p-value is significant. As can be seen, we fail to reject all null hypothesis of no short-run causal relationships within this VEC model context in all eight cases.

Table 12. Lagrange multiplier test for serial autocorrelation

Lag	chi2	df	Prob > chi2
1	195.0197	25	0.00000
2	151.5804	25	0.00000
3	121.0046	25	0.00000
4	85.4349	25	0.00000
5	45.9081	25	0.00658
6	103.5093	25	0.00000
7	57.4534	25	0.00023
8	39.1497	25	0.03559
9	53.9410	25	0.00068
10	41.6826	25	0.01944
11	38.7234	25	0.03926
12	53.2996	25	0.00082

H_0: no autocorrelation at lag order.

Since there are 12 lags in this model, there are 12 possible levels where autocorrelation can occur. As seen in Table 12, we can reject the null hypothesis of no autocorrelation at all lag levels, this at a 5-percentage level. This is not very satisfying since it implies that the model is misspecified. But the Austrian theory includes many variables that have been omitted in this "simple" regression model, such as time preferences, elasticity of expectations etc. The problems with autocorrelation imply too few lags in the model, whereof a VAR model with 13 lags is estimated, see chapter 6.1.2.

Table 13. Jarque-Bera test for normality of the residuals

Equation	chi2	df.	Prob > chi2
ΔEarlyPPI	66.550	2	0.00000
ΔLatePPI	200.138	2	0.00000
ΔEarlyProd	0.419	2	0.81090
ΔLateProd	18.312	2	0.00011
ΔTaylorGap	17.922	2	0.00013
ALL	303.341	10	0.00000

H_0 for the individual equations: The innovation terms within the equations are normally distributed. H_0 for "ALL": All innovation terms have corresponding

The null hypothesis that the residuals is normally distributed is rejected for all equations but the third. Hence, this VEC model may suffer from problems associated with non-normality.

6.1.2 VAR model with TaylorGap

Table 14.

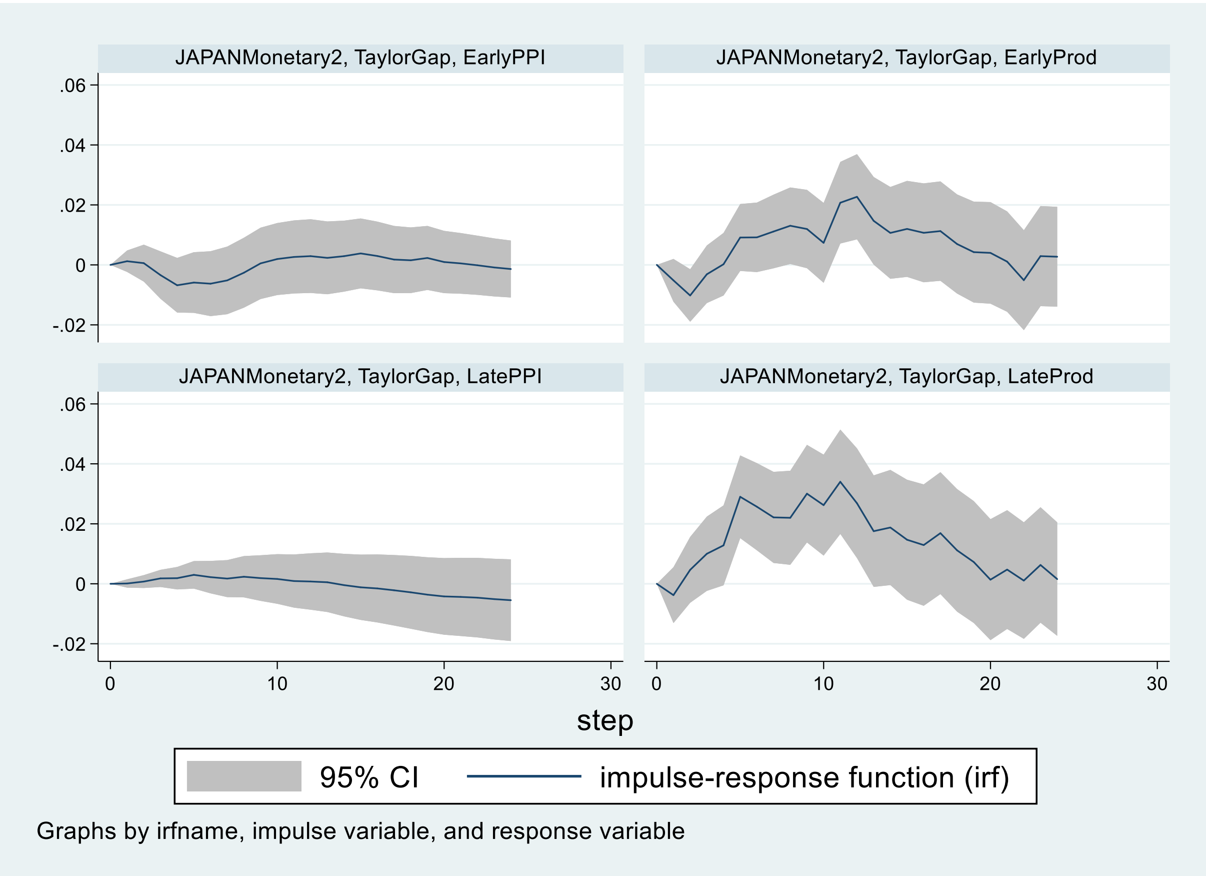
VAR with TaylorGap as the explanatory variable

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
EarlyPPI						
TaylorGap						
L1.	.0012215	.0018291	0.67	0.504	-.0023633	.0048064
L2.	-.0022321	.0023699	-0.94	0.346	-.006877	.0024128
L3.	-.0015969	.0023845	-0.67	0.503	-.0062703	.0030765
L4.	.0012439	.002387	0.52	0.602	-.0034345	.0059223
L5.	.0023912	.0023833	1.00	0.316	-.00228	.0070625
L6.	-.0016125	.0023886	-0.68	0.500	-.0062942	.0030691
L7.	.0011626	.0023899	0.49	0.627	-.0035216	.0058468
L8.	.0008822	.0023715	0.37	0.710	-.0037658	.0055302
L9.	-.0002636	.0023631	-0.11	0.911	-.0048952	.0043681
L10.	-.0009286	.0023413	-0.40	0.692	-.0055174	.0036603
L11.	.0003675	.0022997	0.16	0.873	-.0041398	.0048748
L12.	-.0004773	.0022815	-0.21	0.834	-.004949	.0039944
L13.	.0003726	.0017463	0.21	0.831	-.0030501	.0037953
Constant	.0075469	.0226831	0.33	0.739	-.0369112	.052005
LatePPI						
TaylorGap						
L1.	.000102	.0007079	0.14	0.885	-.0012855	.0014895
L2.	.0005627	.0009172	0.61	0.540	-.0012351	.0023604
L3.	.0003456	.0009229	0.37	0.708	-.0014632	.0021543
L4.	-.0015687	.0009238	-1.70	0.090	-.0033794	.000242
L5.	.0004699	.0009224	0.51	0.610	-.001338	.0022779
L6.	-.0016636	.0009245	-1.80	0.072	-.0034756	.0001483
L7.	.0008076	.000925	0.87	0.383	-.0010054	.0026205
L8.	.0005887	.0009178	0.64	0.521	-.0012102	.0023876
L9.	-.000035	.0009146	-0.04	0.969	-.0018276	.0017576
L10.	.0001879	.0009062	0.21	0.836	-.0015881	.001964
L11.	-.0008067	.0008901	-0.91	0.365	-.0025512	.0009378
L12.	.001027	.000883	1.16	0.245	-.0007037	.0027577
L13.	-.000499	.0006759	-0.74	0.460	-.0018238	.0008257
Constant	.0247393	.0087792	2.82	0.005	.0075324	.0419462
EarlyProd						
TaylorGap						
L1.	-.0051679	.003641	-1.42	0.156	-.0123042	.0019684
L2.	-.0022314	.0047177	-0.47	0.636	-.0114779	.0070151
L3.	.0083197	.0047466	1.75	0.080	-.0009836	.0176229
L4.	-.001001	.0047517	-0.21	0.833	-.0103142	.0083121
L5.	.0100824	.0047444	2.13	0.034	.0007835	.0193813
L6.	-.0064217	.004755	-1.35	0.177	-.0157413	.0028979
L7.	.0048334	.0047576	1.02	0.310	-.0044913	.0141581
L8.	-.0041545	.0047208	-0.88	0.379	-.0134071	.0050981
L9.	-.0024048	.0047042	-0.51	0.609	-.0116248	.0068152
L10.	-.0058702	.0046607	-1.26	0.208	-.0150051	.0032647
L11.	.0071513	.0045779	1.56	0.118	-.0018212	.0161238
L12.	-.0037601	.0045417	-0.83	0.408	-.0126617	.0051415
L13.	-.0040132	.0034764	-1.15	0.248	-.0108267	.0028003
Constant	-.0023406	.0451546	-0.05	0.959	-.0908419	.0861607
LateProd						
TaylorGap						
L1.	-.0037816	.0047544	-0.80	0.426	-.0131	.0055369

L2.	.0101966	.0061602	1.66	0.098	-.0018772	.0222705
L3.	.0008163	.0061981	0.13	0.895	-.0113317	.0129643
L4.	-.0034363	.0062046	-0.55	0.580	-.0155972	.0087246
L5.	.013165	.0061951	2.13	0.034	.0010228	.0253073
L6.	-.0099524	.0062089	-1.60	0.109	-.0221218	.0022169
L7.	-.0025863	.0062123	-0.42	0.677	-.0147622	.0095897
L8.	.0011828	.0061643	0.19	0.848	-.010899	.0132646
L9.	.0077582	.0061426	1.26	0.207	-.0042811	.0197975
L10.	-.0074657	.0060859	-1.23	0.220	-.0193938	.0044625
L11.	.0022075	.0059777	0.37	0.712	-.0095085	.0139236
L12.	-.0057163	.0059305	-0.96	0.335	-.0173398	.0059072
L13.	-.0037334	.0045393	-0.82	0.411	-.0126304	.0051635
Constant	.0998163	.0589617	1.69	0.090	-.0157466	.2153791

Table 14 displays the result from the VAR estimation with $TalyorGap$ as the explanatory variable. In the first section of Table 14 all the lagged ϕ_{im} coefficients are found, and the "constant" terms are equivalent to the σ_i terms in the model specification, i.e. the intercepts. As can be seen in Table 14, most coefficients are not significant at a 5-percentage level. For all coefficients the upper- and lower bond of the 95-percentage confidence intervals are opposed in signs.

Graph 2. Impulse Response Function



Graph 2. The Impulse Response Function results with TaylorGap as the impulse variable. The graphs show the response of the four ratios derived from a positive one-unit impulse in the TaylorGap.

The IRFs in Graph 2 illustrates a positive *one-unit* shock in the $TaylorGap$. It can also be interpreted as a tighter monetary policy in Taylor terms. The responses of a looser policy are the mirror. As seen in Graph 2, a positive one-unit shock in $TaylorGap$ leads to an initial decline in $EarlyPPI$. As seen, the results here are very similar to the results in Graph 1. Noteworthy is that the 95 percent confidence intervals for the production ratios are both above zero for a time. But some argues that running I(1) time-series data in levels causes spurious regressions, whereof the 95 percent confidence intervals may not be fully reliable.

Table 15. Granger Causality Wald test with TaylorGap

H_0	chi2	Df.	Prob > chi2	
TaylorGap do not Granger cause EarlyPPI	5.526	13	0.962	Fail to reject
TaylorGap do not Granger cause LatePPI	13.723	13	0.394	Fail to reject
TaylorGap do not Granger cause EarlyProd	34.318	13	0.001	Reject
TaylorGap do not Granger cause LateProd	34.953	13	0.001	Reject
EarlyPPI do not Granger cause TaylorGap	18.317	13	0.146	Fail to reject
LatePPI do not Granger cause TaylorGap	24.964	13	0.023	Reject
EarlyProd do not Granger cause TaylorGap	15.221	13	0.294	Fail to reject
LateProd do not Granger cause TaylorGap	24.697	13	0.025	Reject

As can be seen in Table 15, there are four null hypotheses that we can reject at an alpha level of 5 percent, and two at an alpha level of 1 percent. The $TaylorGap$ seem to Granger cause $EarlyProd$ and $LateProd$. This could be expected by looking at the relatively high impact the $TaylorGap$ had on the production ratios in Graph 2. There exists bidirectional causality between $LateProd$ and $TaylorGap$. $LatePPI$ further seem to Granger cause the $TaylorGap$.

Table 16. Lagrange multiplier test for serial autocorrelation

Lag	chi2	df	Prob > chi2
1	33.5475	25	0.11794
2	23.6169	25	0.54159
3	23.6792	25	0.53796
4	20.9710	25	0.69423
5	27.1355	25	0.34915
6	41.2158	25	0.02179
7	26.0062	25	0.40727
8	18.2568	25	0.83130
9	37.0220	25	0.05746
10	18.6902	25	0.81173
11	17.3136	25	0.87011
12	45.0659	25	0.00822
13	22.4814	25	0.60782

H_0: no autocorrelation at lag order.

As seen in Table 16, we fail to reject the null hypothesis of no autocorrelation at al lag levels but the twelfth. These results is relatively good compared to the corresponding VEC model in chapter 6.1.1, and implies that this model is more valid. But the Austrian theory includes many variables that have been omitted in this “simple” VAR model, such as time preferences, elasticity of expectations etc. which reasonably is correlated over time.

Table 17. Jarque-Bera test for normality of the residuals

Equation	chi2	df.	Prob > chi2
EarlyPPI	44.048	2	0.00000
LatePPI	169.560	2	0.00000
EarlyProd	18.072	2	0.00012
LateProd	24.915	2	0.00000
TaylorGap	21.271	2	0.00002
ALL	277.866	10	0.00000

H_0 for the individual equations: The residuals within the equations are normally distributed. H_0 for “ALL”: All innovation terms have corresponding dimensional multivariate normal distributions. (Stata, 2019)

The null hypothesis that the residuals is normally distributed is rejected for all five equations. Hence, this VAR model may suffer from problems associated with non-normality.

6.2.1 VEC model with LNMonetaryBase

Table 18.

Long-run coefficients

beta	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ce1						
LNMonetaryBase	.3885394	.0891778	4.36	0.000	.2137541	.5633246
Constant	-6.240928					

Short-run coefficients

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ΔEarlyPPI						
ce1						
λ_1	.0059966	.0046016	1.30	0.193	-.0030225	.0150156
LNMonetaryBase						
LD.	-.0102026	.0353445	-0.29	0.773	-.0794766	.0590713
L2D.	-.0385009	.0357246	-1.08	0.281	-.1085199	.0315181
L3D.	.0090938	.0356949	0.25	0.799	-.0608668	.0790545
L4D.	.0236425	.0360858	0.66	0.512	-.0470844	.0943694
L5D.	.0085924	.0359623	0.24	0.811	-.0618923	.0790772
L6D.	-.0407055	.0360452	-1.13	0.259	-.1113528	.0299418
L7D.	.0344265	.036028	0.96	0.339	-.036187	.10504
L8D.	-.0412202	.0359328	-1.15	0.251	-.1116471	.0292068
L9D.	-.0085323	.0354153	-0.24	0.810	-.077945	.0608803
L10D.	.0027527	.035196	0.08	0.938	-.0662302	.0717356
L11D.	-.021809	.0347521	-0.63	0.530	-.0899219	.046304

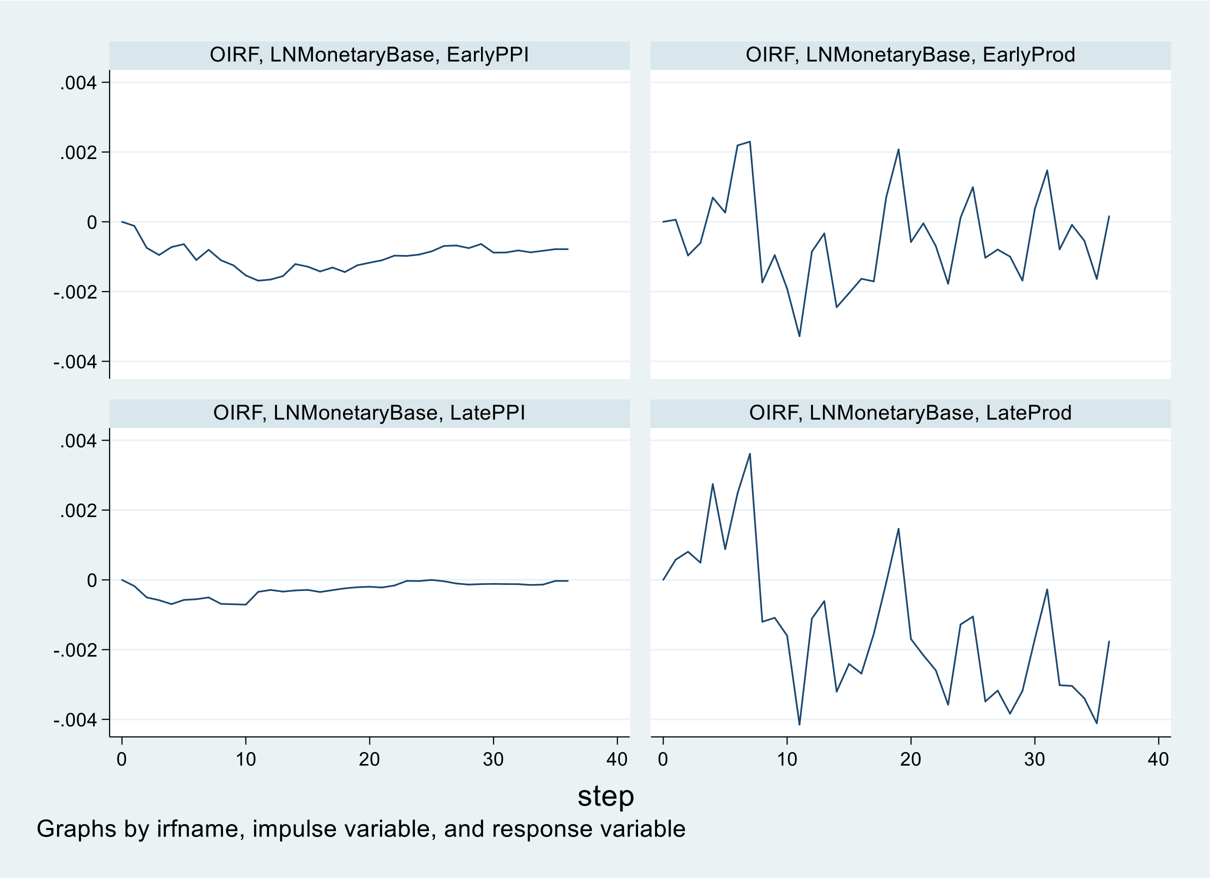
Constant	.0003036	.0008034	0.38	0.705	-.0012711	.0018783
ΔLatePPI						
ce1						
λ_2	.0014146	.001802	0.78	0.432	-.0021173	.0049464
LNMonetaryBase						
LD.	-.0124752	.0138408	-0.90	0.367	-.0396027	.0146524
L2D.	-.0184855	.0139897	-1.32	0.186	-.0459048	.0089338
L3D.	-.0005792	.013978	-0.04	0.967	-.0279757	.0268172
L4D.	-.0054298	.0141311	-0.38	0.701	-.0331264	.0222667
L5D.	.0196703	.0140828	1.40	0.162	-.0079314	.047272
L6D.	.0026445	.0141152	0.19	0.851	-.0250208	.0303099
L7D.	.0047716	.0141085	0.34	0.735	-.0228806	.0324237
L8D.	-.0202597	.0140712	-1.44	0.150	-.0478388	.0073194
L9D.	-.0003351	.0138686	-0.02	0.981	-.027517	.0268468
L10D.	-.0064783	.0137827	-0.47	0.638	-.0334919	.0205353
L11D.	.026486	.0136089	1.95	0.052	-.0001868	.0531589
Constant	-.0001193	.0003146	-0.38	0.705	-.0007359	.0004974
ΔEarlyProd						
ce1						
λ_3	.0522401	.010674	4.89	0.000	.0313194	.0731608
LNMonetaryBase						
LD.	-.0161572	.0819856	-0.20	0.844	-.1768462	.1445317
L2D.	-.0999784	.0828674	-1.21	0.228	-.2623955	.0624386
L3D.	-.0519772	.0827983	-0.63	0.530	-.214259	.1103046
L4D.	.0261516	.0837052	0.31	0.755	-.1379076	.1902108
L5D.	-.0206025	.0834186	-0.25	0.805	-.1841	.142895
L6D.	.1195403	.083611	1.43	0.153	-.0443342	.2834148
L7D.	.0333097	.083571	0.40	0.690	-.1304864	.1971058
L8D.	-.2298981	.0833502	-2.76	0.006	-.3932616	-.0665346
L9D.	-.0375346	.0821498	-0.46	0.648	-.1985453	.123476
L10D.	-.1388377	.0816412	-1.70	0.089	-.2988516	.0211761
L11D.	-.0520393	.0806115	-0.65	0.519	-.210035	.1059564
Constant	-.0011425	.0018637	-0.61	0.540	-.0047952	.0025103
ΔLateProd						
ce1						
λ_4	.0206328	.0145782	1.42	0.157	-.00794	.0492055
LNMonetaryBase						
LD.	.0310374	.1119732	0.28	0.782	-.188426	.2505008
L2D.	.0094139	.1131774	0.08	0.934	-.2124097	.2312375
L3D.	-.0501797	.1130831	-0.44	0.657	-.2718185	.1714592
L4D.	.1029172	.1143217	0.90	0.368	-.1211493	.3269836
L5D.	-.111037	.1139303	-0.97	0.330	-.3343363	.1122623
L6D.	.0884415	.114193	0.77	0.439	-.1353727	.3122557
L7D.	.0912304	.1141384	0.80	0.424	-.1324767	.3149375
L8D.	-.180544	.1138369	-1.59	0.113	-.4036602	.0425722
L9D.	-.1140905	.1121974	-1.02	0.309	-.3339933	.1058123
L10D.	-.0373409	.1115028	-0.33	0.738	-.2558823	.1812005
L11D.	-.2029576	.1100965	-1.84	0.065	-.4187427	.0128276
Constant	.0026901	.0025453	1.06	0.291	-.0022987	.0076789

Table 18 displays the result from the VECM estimation with the natural log of the monetary base ($LNMonetaryBase$) as the explanatory variable. All adjustment terms λ_i, are positive, and only one is significant. In general, a positive adjustment term is not satisfactory since it suggests that the model does not converge to the long-run equilibrium. It may be due to structural changes.

The long-run coefficient is positive and significant at a 1 percent level, but since the adjustment terms are also positive its implications are obscure. Hence, I can't interpret any long-run relationships in this VEC model.

Almost none of the 11 lagged short-run coefficients is statistically significant, which may be reasonably with these many lags. Interpreting the lagged coefficients are further very hard since they fluctuate in signs. Also note that the 95 percent confidence intervals upper- and lower bond have different signs for almost all coefficients.

Graph 3. Orthogonalized Impulse Response Function



Graph 3. Orthogonalized Impulse Response Functions with LNMonetaryBase as the impulse variable.

Graph 3 displays the responses in the four ratios derived from a positive one standard deviation shock in the natural log of the monetary base. According to the OIRFs in Graph 2, all ratios tend to fall when the log of the monetary base increases, which is not in line with the Austrian business cycle theory. Overall, we cannot suggest very much interesting about these graphs.

Table 19. Granger Causality Wald tests with LNMonetaryBase

H_0	chi2	Prob > chi2	
LNMonetaryBase do not Granger cause EarlyPPI	0.08	0.7728	Fail to reject
LNMonetaryBase do not Granger cause LatePPI	0.81	0.3674	Fail to reject
LNMonetaryBase do not Granger cause EarlyProd	0.04	0.8438	Fail to reject
LNMonetaryBase do not Granger cause LateProd	0.08	0.7816	Fail to reject
EarlyPPI do not Granger cause LNMonetaryBase	0.01	0.9389	Fail to reject
LatePPI do not Granger cause LNMonetaryBase	0.37	0.5435	Fail to reject
EarlyProd do not Granger cause LNMonetaryBase	0.39	0.5348	Fail to reject
LateProd do not Granger cause LNMonetaryBase	0.01	0.9233	Fail to reject

As seen in Table 19, all p values are high, so we cannot reject the null hypotheses of no Granger causality in neither of the cases. Even though monetary base by theory should reasonably have an impact on the structure of production, we cannot by use of these Granger tests see any relationships. This match with my predestination hypothesis of no suggested causes from the monetary base, this since the monetary base has exploded in Japan in later years when domestic interest rates was already very low.

Table 20. Lagrange multiplier test for serial autocorrelation

Lag	chi2	df	Prob > chi2
1	181.9679	25	0.00000
2	106.6040	25	0.00000
3	117.6817	25	0.00000
4	70.3750	25	0.00000
5	47.8544	25	0.00388
6	113.3419	25	0.00000
7	62.3648	25	0.00005
8	67.1082	25	0.00001
9	38.5351	25	0.04098
10	55.3354	25	0.00044
11	56.0081	25	0.00036
12	45.9502	25	0.00650

H_0: no autocorrelation at lag order.

Table 20 shows that we can reject all of the null hypotheses of no autocorrelation. Hence, there are autocorrelated residuals on all lag levels in this VEC model. This suggests that this model is misspecified. On the other hand, if running a VAR(13) without cointegration we cannot reject most of the null hypotheses. This again illustrates the importance of model choices.

Table 21. Jarque-Bera test for normality of the residuals

Equation	chi2	df	Prob > chi2
ΔEarlyPPI	85.829	2	0.00000
ΔLatePPI	132.971	2	0.00000
ΔEarlyProd	8.242	2	0.01623
ΔLateProd	39.158	2	0.00000
ΔLNMonetaryBase	2959.858	2	0.00000
ALL	3226.057	10	0.00000

H_0 for the individual equations: The innovation terms within the equations are normally distributed. H_0 for "ALL": All innovation terms have corresponding dimensional multivariate normal distributions. (Stata, 2019)

As seen in Table 21, we can reject all null hypotheses that the residuals are normally distributed at a significant level of 5 percent. All but the third equation can be rejected on a 1 percent significant level. This suggests that this VEC model may suffer from the problems with non-normality. Normality is only a sufficient condition for validity though. The use of dummies may possible reduce these problems but may have drawbacks also.

All results with the monetary base as the explanatory variable are vague and the diagnostics implies that the model may not be very valid. The impact of the monetary base can be underestimated compared to the world as a whole because of the mentioned already low interest rates in Japan when the domestic quantitative easing programs took of more seriously in the early 2010s. And because of this it would not be surprising, from the Austrian prospective, if the monetary base is at least slightly more correlated with the structure of production in Japan if we do not include the 2000s data.

6.2.2 VAR model with LNMonetaryBase

Table 22.

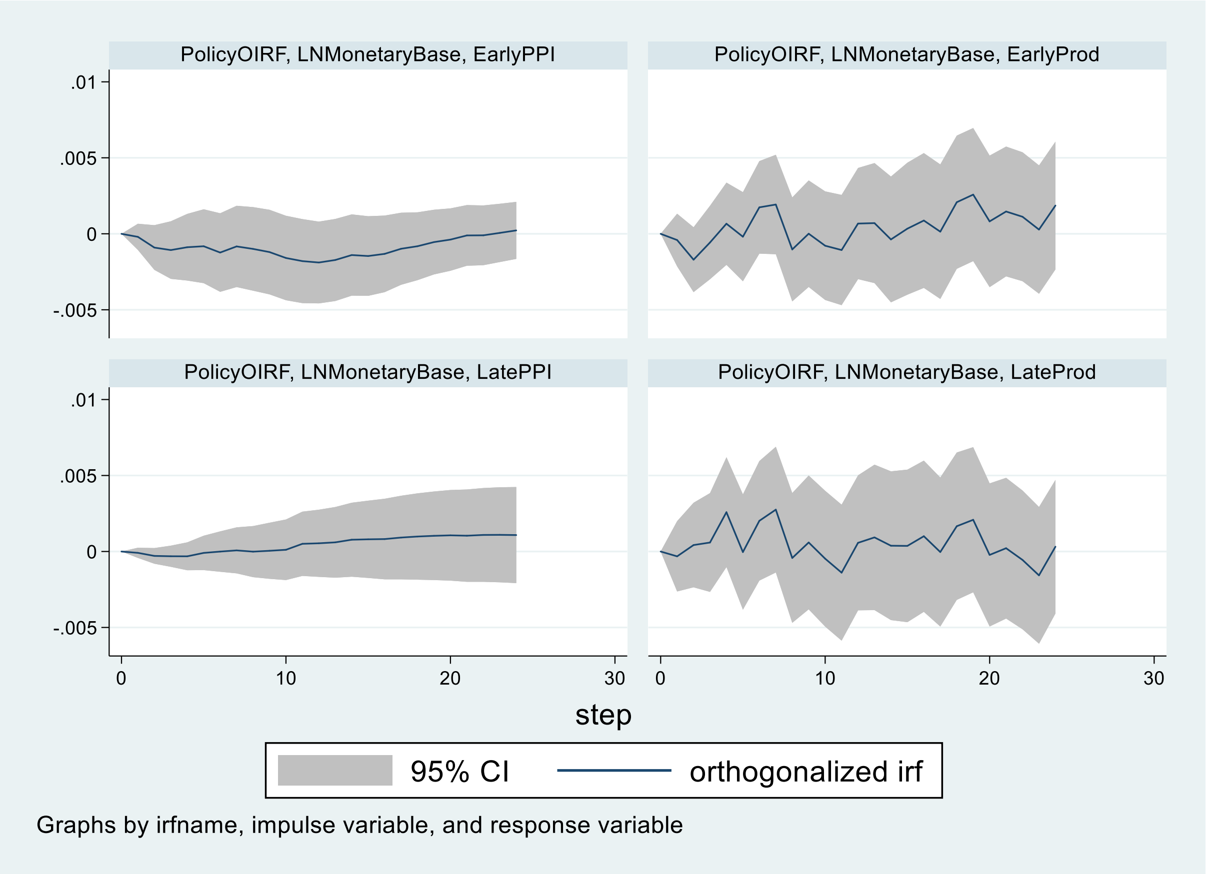
VAR with LNMonetaryBase as the explanatory variable

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
EarlyPPI						
LNMonetaryBase						
L1.	-.0148106	.0323534	-0.46	0.647	-.0782221	.0486009
L2.	-.0291953	.0498849	-0.59	0.558	-.126968	.0685774
L3.	.0652953	.0495427	1.32	0.188	-.0318067	.1623973
L4.	.0055855	.0490875	0.11	0.909	-.0906242	.1017951
L5.	-.0222678	.0489727	-0.45	0.649	-.1182525	.073717
L6.	-.0429199	.0488861	-0.88	0.380	-.1387349	.0528951
L7.	.0765091	.0486608	1.57	0.116	-.0188643	.1718825
L8.	-.0847152	.0486827	-1.74	0.082	-.1801316	.0107011
L9.	.0361313	.0489437	0.74	0.460	-.0597965	.1320591
L10.	.0079737	.0488065	0.16	0.870	-.0876853	.1036327
L11.	-.0256432	.0482343	-0.53	0.595	-.1201807	.0688944

L12.	.0371268	.0481078	0.77	0.440	-.0571629	.1314164
L13.	-.0065326	.032284	-0.20	0.840	-.069808	.0567428
Constant	-.0154828	.0332041	-0.47	0.641	-.0805617	.0495961
LatePPI						
LNMonetaryBase						
L1.	-.0065606	.0125904	-0.52	0.602	-.0312373	.0181161
L2.	-.0076063	.0194128	-0.39	0.695	-.0456547	.0304421
L3.	.0109167	.0192796	0.57	0.571	-.0268706	.0487041
L4.	-.0010983	.0191025	-0.06	0.954	-.0385385	.0363418
L5.	.0265443	.0190578	1.39	0.164	-.0108083	.063897
L6.	-.0193828	.0190241	-1.02	0.308	-.0566693	.0179038
L7.	.0017621	.0189364	0.09	0.926	-.0353526	.0388768
L8.	-.0226205	.0189449	-1.19	0.232	-.0597519	.014511
L9.	.0202425	.0190465	1.06	0.288	-.017088	.0575729
L10.	-.0068327	.0189931	-0.36	0.719	-.0440586	.0303931
L11.	.0314252	.0187705	1.67	0.094	-.0053642	.0682146
L12.	-.0374161	.0187212	-2.00	0.046	-.074109	-.0007231
L13.	.0121576	.0125634	0.97	0.333	-.0124661	.0367813
Constant	.0045929	.0129214	0.36	0.722	-.0207327	.0299184
EarlyProd						
LNMonetaryBase						
L1.	-.0301586	.0648876	-0.46	0.642	-.1573361	.0970188
L2.	-.0700693	.1000487	-0.70	0.484	-.2661612	.1260226
L3.	.1430677	.0993624	1.44	0.150	-.051679	.3378144
L4.	.0142933	.0984493	0.15	0.885	-.1786638	.2072503
L5.	-.087131	.0982192	-0.89	0.375	-.279637	.1053751
L6.	.1781334	.0980454	1.82	0.069	-.0140321	.3702989
L7.	-.0973339	.0975936	-1.00	0.319	-.2886138	.093946
L8.	-.2322336	.0976375	-2.38	0.017	-.4235996	-.0408676
L9.	.2127835	.0981609	2.17	0.030	.0203917	.4051752
L10.	-.1528638	.0978858	-1.56	0.118	-.3447165	.0389889
L11.	.151681	.0967383	1.57	0.117	-.0379225	.3412845
L12.	.0349823	.0964846	0.36	0.717	-.1541239	.2240886
L13.	-.0507461	.0647484	-0.78	0.433	-.1776506	.0761584
Constant	-.2112625	.0665938	-3.17	0.002	-.341784	-.0807409
LateProd						
LNMonetaryBase						
L1.	-.0234459	.0867508	-0.27	0.787	-.1934744	.1465827
L2.	.0726667	.1337591	0.54	0.587	-.1894963	.3348297
L3.	-.0450228	.1328415	-0.34	0.735	-.3053874	.2153417
L4.	.1036127	.1316207	0.79	0.431	-.1543592	.3615846
L5.	-.2903621	.1313131	-2.21	0.027	-.547731	-.0329931
L6.	.3125977	.1310808	2.38	0.017	.0556841	.5695113
L7.	-.0651287	.1304767	-0.50	0.618	-.3208583	.190601
L8.	-.1864055	.1305354	-1.43	0.153	-.4422503	.0694392
L9.	.1225191	.1312351	0.93	0.351	-.134697	.3797352
L10.	-.0967682	.1308674	-0.74	0.460	-.3532636	.1597271
L11.	.0285509	.1293332	0.22	0.825	-.2249374	.2820393
L12.	.1396082	.128994	1.08	0.279	-.1132155	.3924318
L13.	-.0685412	.0865646	-0.79	0.428	-.2382048	.1011224
Constant	.0160323	.0890319	0.18	0.857	-.158467	.1905317

In Table 22 the result from the VAR estimation with LNMonetaryBase as the explanatory variable is displayed. As seen in the table, all p-values are high, and the coefficients fluctuates in sign. But looking at the 95 percent confidence intervals we cannot be sure of the sign since the coefficients in the upper bond are positive, while the coefficients in the lower bond are negative. The two production ratios have relatively large coefficients but fluctuate in signs and are not significant either. As in the corresponding VEC model, the upper- and lower bonds of the confidence intervals are opposed in signs.

Graph 4. Orthogonalized Impulse Response Function



Graph 4. Orthogonalized Impulse Response Functions with LNMonetaryBase as the impulse variable.

As seen in Graph 4, the effects on the four ratios derived from a positive one standard deviation shock in LNMonetaryBase are modest, and the 95 percent confidence intervals are large as well. Compared to the corresponding VEC model OIRFs in Graph 3, the results are very similar. However, we cannot by use of these results conclude anything.

Table 23. Granger Causality Wald tests with LNMonetaryBase

H_0	chi2	Prob > chi2	
LNMonetaryBase do not Granger cause EarlyPPI	0.08	0.7728	Fail to reject
LNMonetaryBase do not Granger cause LatePPI	0.81	0.3674	Fail to reject
LNMonetaryBase do not Granger cause EarlyProd	0.04	0.8438	Fail to reject
LNMonetaryBase do not Granger cause LateProd	0.08	0.7816	Fail to reject
EarlyPPI do not Granger cause LNMonetaryBase	0.01	0.9389	Fail to reject
LatePPI do not Granger cause LNMonetaryBase	0.37	0.5435	Fail to reject
EarlyProd do not Granger cause LNMonetaryBase	0.39	0.5348	Fail to reject
LateProd do not Granger cause LNMonetaryBase	0.01	0.9233	Fail to reject

As seen in Table 23, all p values are high, so we cannot reject the null hypotheses of no Granger causality in neither of the cases. Even though monetary base by theory have an impact on the economy, we cannot by use of these tests found any relationships. This match with my predestination hypothesis of no suggested causes from the monetary base, this since the monetary base has exploded in Japan in later years when domestic interest rates was already very low.

Table 24. Lagrange multiplier test for serial autocorrelation

Lag	chi2	df	Prob > chi2
1	31.6950	25	0.16703
2	24.0866	25	0.51437
3	21.5201	25	0.66328
4	24.8897	25	0.46857
5	36.4855	25	0.06455
6	49.4995	25	0.00246
7	28.7116	25	0.27615
8	33.2156	25	0.12577
9	20.6721	25	0.71075
10	30.3303	25	0.21216
11	34.8560	25	0.09084
12	51.0253	25	0.00159
13	30.4782	25	0.20688

H_0: no autocorrelation at lag order.

First at the fifth lag level can we reject the null hypothesis of no autocorrelation at lag order, aa a 5-percentage level. This implies that this VAR model is less misspecified than the corresponding VEC model in chapter 6.2.1. It also suggests that this model is relatively valid, but not overfitted either, which is also to expect using the actual lag selection criteria's mentioned in chapter 5.

Table 25. Jarque-Bera test.

Equation	chi2	df	Prob > chi2
EarlyPPI	48.231	2	0.00000
LatePPI	136.619	2	0.00000
EarlyProd	27.907	2	0.00000
LateProd	28.657	2	0.00000
LNMonetaryBase	2454.876	2	0.00000
ALL	2696.289	10	0.00000

H_0 for the individual equations: The innovation terms within the equations are normally distributed. H_0 for "ALL": All innovation terms have corresponding dimensional multivariate normal distributions. (Stata, 2019)

We can reject all null hypotheses that the residuals are normally distributed at a significant level of 1 percent. This suggests that this VAR model may suffer from the problems with non-normality. Normality is not a necessary condition for a valid model though. The use of dummies may have reduced these problems but may have had other drawbacks.

All results with the log of the monetary base as the explanatory variable are vague and the test for normality of the residuals suggest that the models may not be very valid, even though the test for autocorrelation implies that the VAR model is more valid than the VEC model in chapter 6.2.1. The results can be underestimated and hard to generalize since, as already mentioned, the interest rates was at the zero lower bond in Japan when the domestic quantitative easing programs was implemented in the early 2000s.

6.3.1 VEC model with the Policy rate

Table 26.

Long-run coefficients

beta	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ce1						
PolicyRate	.0530645	.0256884	2.07	0.039	.0027161	.1034129
Constant	-5.718363					

Short-run coefficients

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ΔEarlyPPI						
ce1						
λ_1	.0063928	.0047704	1.34	0.180	-.002957	.0157426
PolicyRate						
LD.	.0001485	.0021842	0.07	0.946	-.0041325	.0044295
L2D.	.0001718	.0021258	0.08	0.936	-.0039948	.0043383
L3D.	.0029102	.0021581	1.35	0.177	-.0013196	.0071401
L4D.	.0028835	.0021967	1.31	0.189	-.001422	.007189
L5D.	.0004073	.0022074	0.18	0.854	-.0039191	.0047337

L6D.	.0014238	.0022045	0.65	0.518	-.002897	.0057445
L7D.	-.0006623	.0022268	-0.30	0.766	-.0050267	.0037021
L8D.	-.0039629	.0022077	-1.80	0.073	-.0082898	.0003641
L9D.	-.0031343	.0021486	-1.46	0.145	-.0073454	.0010768
L10D.	-.000489	.0021503	-0.23	0.820	-.0047034	.0037255
L11D.	.0001907	.0020987	0.09	0.928	-.0039226	.004304
Constant	.0002031	.0006116	0.33	0.740	-.0009957	.0014018
ΔLatePPI						
ce1						
λ_2	-.003939	.0018467	-2.13	0.033	-.0075584	-.0003196
PolicyRate						
LD.	-.0010179	.0008455	-1.20	0.229	-.0026751	.0006393
L2D.	-.0012373	.0008229	-1.50	0.133	-.0028502	.0003757
L3D.	-.0022291	.0008354	-2.67	0.008	-.0038665	-.0005917
L4D.	.0007345	.0008504	0.86	0.388	-.0009322	.0024012
L5D.	.000714	.0008545	0.84	0.403	-.0009608	.0023888
L6D.	.0013688	.0008534	1.60	0.109	-.0003038	.0030414
L7D.	.0006993	.000862	0.81	0.417	-.0009901	.0023888
L8D.	-.0008369	.0008546	-0.98	0.327	-.0025119	.0008381
L9D.	-.0001921	.0008317	-0.23	0.817	-.0018222	.0014381
L10D.	-.0002338	.0008324	-0.28	0.779	-.0018652	.0013977
L11D.	.0012097	.0008124	1.49	0.136	-.0003826	.002802
Constant	.000223	.0002368	0.94	0.346	-.000241	.0006871
ΔEarlyProd						
ce1						
λ_3	.0101436	.0112685	0.90	0.368	-.0119423	.0322295
PolicyRate						
LD.	.0042944	.0051596	0.83	0.405	-.0058181	.014407
L2D.	.0070987	.0050216	1.41	0.157	-.0027435	.0169409
L3D.	-.0034283	.0050979	-0.67	0.501	-.01342	.0065633
L4D.	-.0023968	.0051891	-0.46	0.644	-.0125673	.0077736
L5D.	-.0123491	.0052143	-2.37	0.018	-.0225688	-.0021293
L6D.	-.0068362	.0052075	-1.31	0.189	-.0170427	.0033702
L7D.	-.0129109	.00526	-2.45	0.014	-.0232203	-.0026014
L8D.	-.0107738	.0052149	-2.07	0.039	-.0209948	-.0005527
L9D.	-.0068427	.0050753	-1.35	0.178	-.0167902	.0031047
L10D.	-.0001139	.0050794	-0.02	0.982	-.0100692	.0098415
L11D.	-.0081153	.0049575	-1.64	0.102	-.0178318	.0016011
Constant	.0020961	.0014447	1.45	0.147	-.0007355	.0049277
ΔLateProd						
ce1						
λ_4	-.0419137	.0144704	-2.90	0.004	-.0702752	-.0135522
PolicyRate						
LD.	.0030952	.0066256	0.47	0.640	-.0098907	.0160812
L2D.	-.0082256	.0064485	-1.28	0.202	-.0208643	.0044132
L3D.	-.008345	.0065464	-1.27	0.202	-.0211757	.0044857
L4D.	-.0111174	.0066635	-1.67	0.095	-.0241777	.001943
L5D.	-.0249558	.0066959	-3.73	0.000	-.0380794	-.0118321
L6D.	-.0155816	.0066871	-2.33	0.020	-.0286882	-.0024751
L7D.	-.0052327	.0067546	-0.77	0.439	-.0184715	.0080061
L8D.	-.0122392	.0066967	-1.83	0.068	-.0253646	.0008861
L9D.	-.0140458	.0065174	-2.16	0.031	-.0268197	-.0012719
L10D.	-.0116759	.0065226	-1.79	0.073	-.02446	.0011082
L11D.	-.0153004	.0063661	-2.40	0.016	-.0277777	-.0028231
Constant	.0048738	.0018552	2.63	0.009	.0012376	.00851

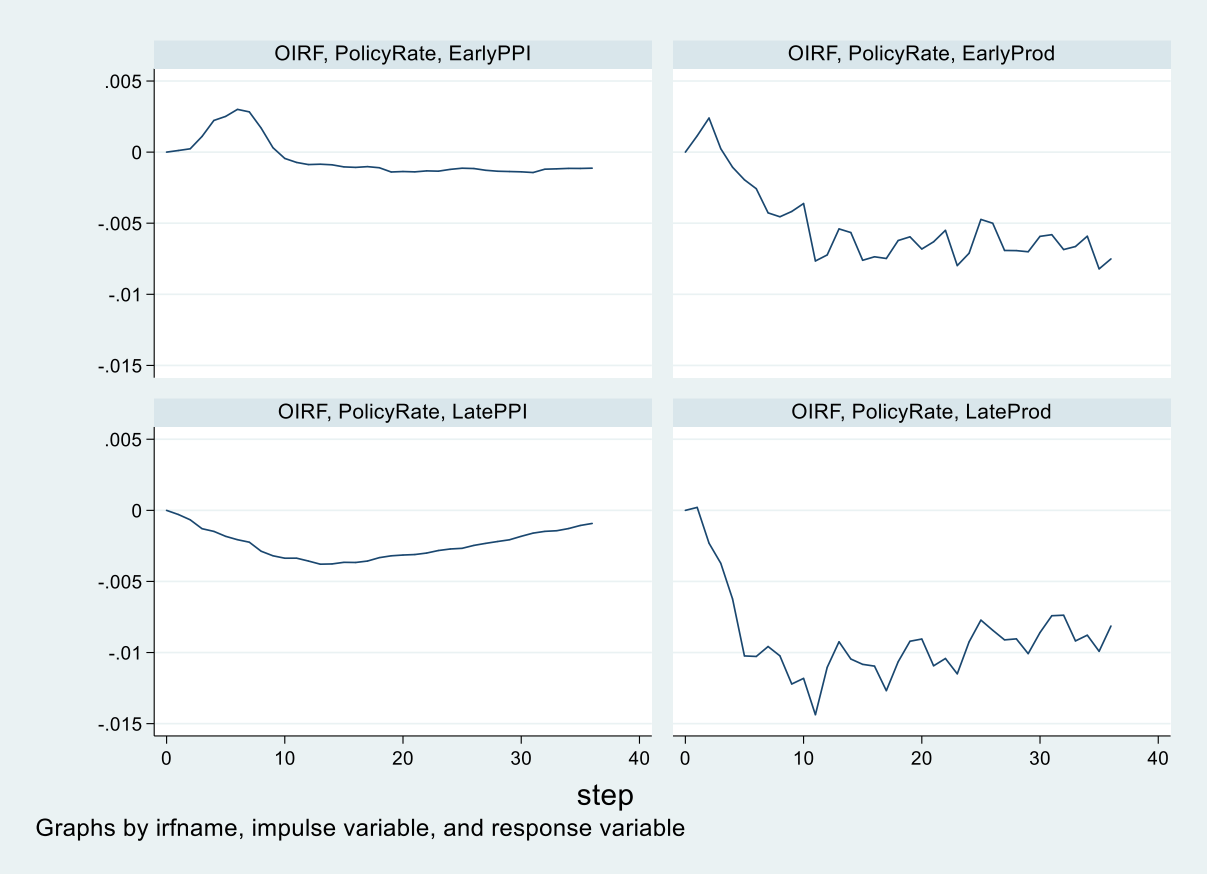
Table 26 displays the result from the VEC model estimation with the Policy rate of the Bank of Japan as the explanatory variable. First looking at the long-run coefficient we see that it is positive and significant at a 5 percent level. The upper- and lower bonds of the confidence intervals are both positive. Further looking at the adjustment terms, we see that those corresponding too late to intermediate price and production are negative, whereas those corresponding too early to intermediate price and production are positive. These results suggest that in the long-run, the Policy rate has a negative impact on late to intermediate prices and production. These findings are in line with the Austrian business cycle theory if we recognize that business cycles can be relatively long. That only the two ratios corresponding to late stages have long-run relationships may be in line with the over-consumption "version" of the theory, where the fervent positive demand derived effect is counterbalancing the over-investments in early stages.

Looking at the short-run coefficients for the two price ratios we see that they fluctuate and are non-significant. The upper- and lower bonds of the confidence intervals are also of opposite signs. Hence, we can't suggest anything with certainty about these coefficients.

Looking at the short-run coefficients for the production ratios instead we see that they are for the most negative, but not significant. The signs for the production ratios are in line with the Austrian business cycle theory, but the upper- and lower bonds of the confidence intervals are for the most of conflicting signs. Forgetting about the confidence intervals, the results are in line with the Austrian theory. This since when the interest rate decreases, there are as explained in chapter 2.3 two opposing tendencies, one for a more, and one for a less, roundabout structure of production.

As seen in Appendix 2, R-squared is relatively high for the $\Delta EarlyProd$ and $\Delta LateProd$ equations, but relatively low for the two remaining equations.

Graph 5. Orthogonalized Impulse Response Function



Graph 5. Orthogonalized Impulse Response Functions with the short-term target Policy rate of the Bank of Japan as the impulse variable.

Graph 5 displays how the four ratios are affected by a positive one standard deviation shock in the Policy rate. I will interpret the result in Graph 5 in terms of a *negative* shock to easier connect with the outlaid theory. The results suggest that, following a lowered Policy rate, $EarlyPPI$ initially decrease but starts to increase after about 8 months and then becomes higher than previously. This latter increase is in line with the theory, but the initial decrease is not explainable from a theoretical point of view. However, the latter increase is also very small.

$LatePPI$ initially increases but decrease with a lag of about 12 months. This increase is in line with the Austrian business cycle theory, but the latter decrease is harder to interpreted, but it continues to be above zero throughout the estimated period. We must also recognize that this graph shows the response to a one-time shock in the Policy rate. As among other Rothbard (1996) argued, and I explained in chapter 2.3, this should have a relatively small effect on the structure of production. This latter reasoning applies to all OIRF/IRFs in this paper.

The OIRFs further suggests that both $EarlyProd$ and $LateProd$ increases when the Policy rate is lowered. This is in line with the conventional "Garrisonian" version of the Austrian business cycle theory, which suggest one tendency for a more, and one for a less, roundabout structure of production. I did further estimate a VAR(13) with no cointegration and the corresponding IRFs looked very similar, see next chapter.

Table 27. Granger Causality tests with the Policy rate

H_0	chi2	df.	Prob > chi2	
Policy rate do not Granger cause EarlyPPI	9.397	13	0.9458	Fail to reject
Policy rate do not Granger cause LatePPI	29.355	13	0.2286	Fail to reject
Policy do not Granger cause EarlyProd	28.903	13	0.4052	Fail to reject
Policy do not Granger cause LateProd	39.473	13	0.6404	Fail to reject
EarlyPPI do not Granger cause Policy rate	22.74	13	0.0790	Fail to reject
LatePPI do not Granger cause Policy rate	36.743	13	0.0665	Fail to reject
EarlyProd do not Granger cause Policy rate	13.65	13	0.1919	Fail to reject
LateProd do not Granger cause Policy rate	19.984	13	0.0581	Fail to reject

As seen in Table 27, we canon reject any of the null-hypotheses on a 5 percent level within this VEC model context.

Table 28. Lagrange multiplier test for serial autocorrelation

Lag	chi2	df	Prob > chi2
1	221.3160	25	0.00000
2	165.0329	25	0.00000
3	147.8026	25	0.00000
4	105.6071	25	0.00000
5	48.2233	25	0.00351
6	124.0653	25	0.00000
7	70.9385	25	0.00000
8	52.7677	25	0.00096
9	70.0556	25	0.00000
10	41.3353	25	0.02116
11	44.1920	25	0.01032
12	79.0662	25	0.00000

H_0: no autocorrelation at lag order.

As seen in Table 28, we can reject the null hypothesis of no autocorrelation in this VEC model at all of the lagged levels. This suggest that there are autocorrelated residuals at all the lag levels in this model, and further implies a misspecified model. However, it's not only the Policy rate the Austrian business cycle theory is built on, which means that there may be *omitted and correlated variables* that may have reduced the autocorrelation of the residuals if they were included in the model.

Table 29. Jarque-Bera test for normality of the residuals

Equation	chi2	df	Prob > chi2
ΔEarlyPPI	73.493	2	0.00000
ΔLatePPI	229.079	2	0.00000
ΔEarlyProd	1.189	2	0.55193
ΔLateProd	15.667	2	0.00040
ΔPolicyRate	6.836	2	0.03277
ALL	326.264	10	0.00000

H_0 for the individual equations: The innovation terms within the equation are normally distributed. H_0 for "ALL": All innovation terms have corresponding dimensional multivariate normal distributions. (Stata, 2019)

We can reject the null hypothesis of normally distributed residuals in all five equations but the $\Delta EarlyProd$. Nor can we say that the VEC model all together have normal distributed residuals. This implies that this VEC model is not be free from problems associated with non-normality. But normality is only a sufficient condition for a valid model, not a necessary (Mulligan, 2006). The Policy rate is only a simple operationalization for the interest rates the Austrian business cycle theory is built on, and many aspects of the theory are not included in the regression model.

6.3.2 VAR model with the Policy rate

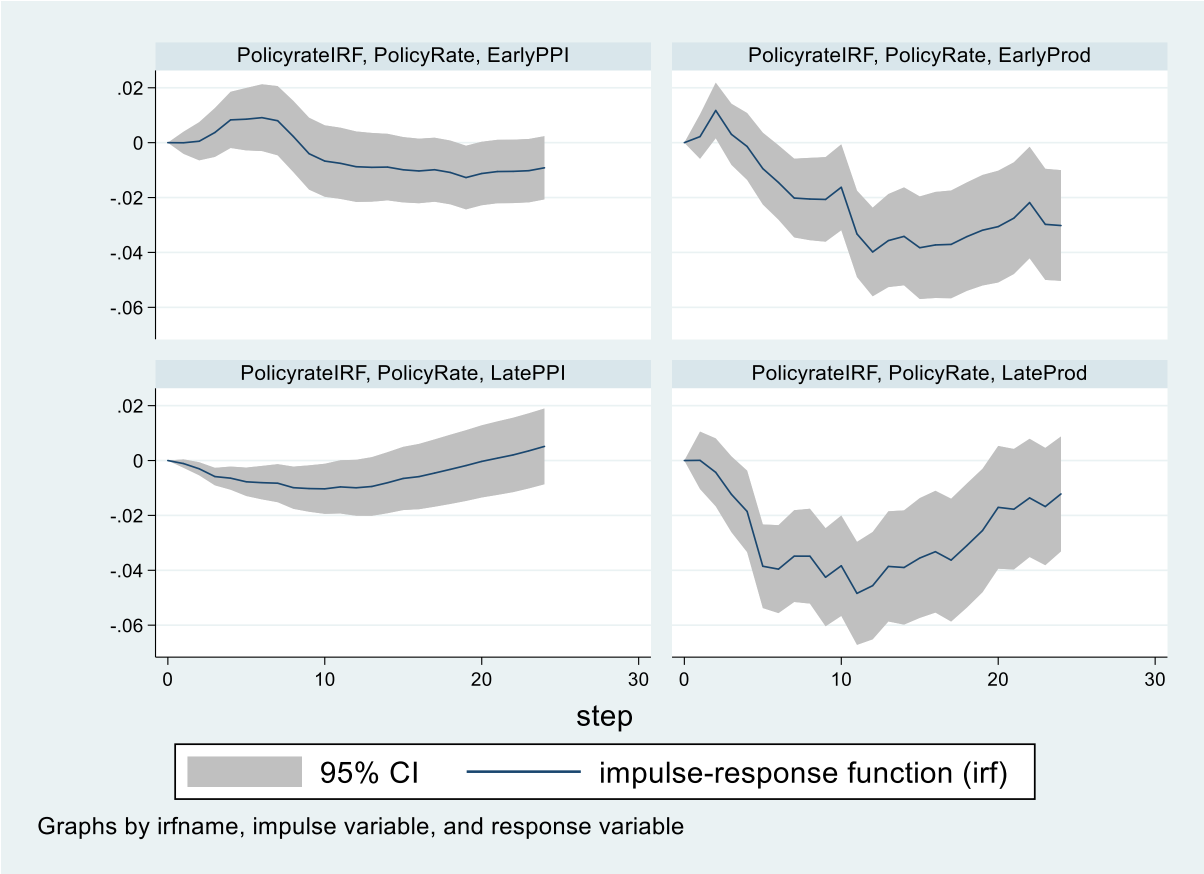
Table 30. VAR with the Policy rate as the explanatory variable.

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
EarlyPPI						
PolicyRate						
L1.	-.0000354	.0020538	-0.02	0.986	-.0040608	.00399
L2.	.0006466	.0027071	0.24	0.811	-.0046592	.0059525
L3.	.0020594	.0027126	0.76	0.448	-.0032571	.007376
L4.	.0000251	.0027234	0.01	0.993	-.0053127	.0053629
L5.	-.0026753	.002749	-0.97	0.330	-.0080631	.0027126
L6.	.0007955	.002753	0.29	0.773	-.0046003	.0061912
L7.	-.0011315	.002741	-0.41	0.680	-.0065039	.0042408
L8.	-.0034682	.0027287	-1.27	0.204	-.0088164	.00188
L9.	.0010163	.0027304	0.37	0.710	-.0043351	.0063678
L10.	.002714	.0026885	1.01	0.313	-.0025554	.0079834
L11.	.0002008	.0026182	0.08	0.939	-.0049308	.0053325
L12.	-.0014812	.0026146	-0.57	0.571	-.0066057	.0036432
L13.	.0008551	.0019715	0.43	0.664	-.003009	.0047191
Constant	.0258289	.0318721	0.81	0.418	-.0366392	.088297
LatePPI						
PolicyRate						
L1.	-.0011091	.0007842	-1.41	0.157	-.002646	.0004279
L2.	-.0007101	.0010336	-0.69	0.492	-.002736	.0013157
L3.	-.0007212	.0010357	-0.70	0.486	-.0027511	.0013087
L4.	.0031909	.0010398	3.07	0.002	.0011529	.0052289
L5.	-.000063	.0010496	-0.06	0.952	-.0021202	.0019941
L6.	.0011503	.0010511	1.09	0.274	-.0009098	.0032105

L7.	-.0011672	.0010465	-1.12	0.265	-.0032184	.000884
L8.	-.0011658	.0010418	-1.12	0.263	-.0032078	.0008762
L9.	.0005254	.0010425	0.50	0.614	-.0015178	.0025686
L10.	-.000221	.0010265	-0.22	0.830	-.0022329	.0017909
L11.	.0016988	.0009997	1.70	0.089	-.0002605	.0036581
L12.	-.0018494	.0009983	-1.85	0.064	-.003806	.0001071
L13.	.000691	.0007527	0.92	0.359	-.0007844	.0021663
Constant	.0148732	.012169	1.22	0.222	-.0089776	.038724
EarlyProd						
PolicyRate						
L1.	.0022133	.0041332	0.54	0.592	-.0058875	.0103142
L2.	.0082464	.0054478	1.51	0.130	-.0024312	.018924
L3.	-.0142888	.0054588	-2.62	0.009	-.0249879	-.0035896
L4.	.0018162	.0054807	0.33	0.740	-.0089257	.0125581
L5.	-.0113611	.0055321	-2.05	0.040	-.0222037	-.0005185
L6.	.0054495	.0055402	0.98	0.325	-.0054091	.016308
L7.	-.0025303	.0055161	-0.46	0.646	-.0133417	.0082811
L8.	.0046569	.0054913	0.85	0.396	-.0061058	.0154197
L9.	.0031064	.0054947	0.57	0.572	-.007663	.0138757
L10.	.0061144	.0054104	1.13	0.258	-.0044898	.0167186
L11.	-.0108197	.005269	-2.05	0.040	-.0211468	-.0004927
L12.	.0043577	.0052616	0.83	0.408	-.0059548	.0146702
L13.	.0020531	.0039675	0.52	0.605	-.005723	.0098292
Constant	.0236719	.06414	0.37	0.712	-.1020402	.149384
LateProd						
PolicyRate						
L1.	.0000757	.0053364	0.01	0.989	-.0103835	.0105349
L2.	-.0044335	.0070338	-0.63	0.528	-.0182195	.0093525
L3.	-.0050983	.007048	-0.72	0.469	-.0189122	.0087155
L4.	.0011773	.0070762	0.17	0.868	-.0126918	.0150464
L5.	-.0166772	.0071425	-2.33	0.020	-.0306763	-.0026781
L6.	.0112852	.007153	1.58	0.115	-.0027345	.0253049
L7.	.0109008	.007122	1.53	0.126	-.003058	.0248597
L8.	-.0035802	.0070899	-0.50	0.614	-.0174762	.0103158
L9.	-.0060364	.0070943	-0.85	0.395	-.019941	.0078681
L10.	.0045829	.0069855	0.66	0.512	-.0091084	.0182741
L11.	-.0028605	.0068029	-0.42	0.674	-.0161939	.010473
L12.	.0063599	.0067934	0.94	0.349	-.0069549	.0196746
L13.	.0013975	.0051225	0.27	0.785	-.0086424	.0114373
Constant	.2492698	.0828125	3.01	0.003	.0869603	.4115793

Table 30 displays the result from the VAR estimation with the Policy rate as the explanatory variable. As can be seen in the table, all lagged coefficients are relatively modest, and the corresponding p-values are high. The 95 percent confidence intervals upper- and lower bonds are for the most of conflicting signs, which makes possible conclusions weak. Compared to the VAR- and VEC estimations with the $TaylorGap$ variable, the signs of the production coefficients are most often the opposite.

Graph 6. Impulse Response Function



Graph 6. Impulse Response Functions with the Policy rate of the Bank of Japan as the impulse variable.

Graph 6 displays how the four ratios responds to a positive one unit, i.e. 100 base points in this context, shock in the Policy rate. The results in the table is very similar to the results in Graph 5, so I skip an exhaustive interpretation. All four 95 percent confidence intervals are either above or below zero for some period following the shock, depending on if we interpret the graph as a positive or negative shock. The two graphs corresponding to the production ratios have 95 percent confidence intervals above 0.02 after about one year, following a negative shock in the Policy rate. However, some may argue that the confidence intervals could be "spurious" since the model is estimated in levels with I(1) variables. But the signs in the VEC and VAR derived impulse responses are very similar, which may strengthen the results. As may also be noted, Graph 6 is almost like a mirror image of Graph 1 and 2 with the $TaylorGap$ variable.

Table 31. Granger causality Wald tests with the Policy rate

H_0	chi2	df.	Prob > chi2	
Policy rate do not Granger cause EarlyPPI	9.397	13	0.742	Fail to reject
Policy rate do not Granger cause LatePPI	29.355	13	0.006	Reject
Policy do not Granger cause EarlyProd	28.903	13	0.007	Reject
Policy do not Granger cause LateProd	39.473	13	0.000	Reject
EarlyPPI do not Granger cause Policy rate	22.74	13	0.045	Reject
LatePPI do not Granger cause Policy rate	36.743	13	0.000	Reject
EarlyProd do not Granger cause Policy rate	13.65	13	0.399	Fail to reject
LateProd do not Granger cause Policy rate	19.984	13	0.096	Fail to reject

Looking at Table 31, we can reject 5 of the null-hypotheses on a 5 percent level. First, we see that the Policy rate Granger causes$LatePPI$, $EarlyProd$ and $LateProd$. But we further see that $EarlyPPI$ and $LatePPI$ Granger causes the Policy rate. The rejection of the null hypotheses also implies that the 13 lagged values of $LatePPI$, $EarlyProd$ and $LateProd$ cannot be excluded from the model without losing explanatory power. The variables $LatePPI$ and Policy rate are endogenous to each other, or there exists “bidirectional causality” between them. These results differ to those found within the VEC model context in chapter 6.3.1. Finally, these causations should be thought of as short-run causality.

Table 32. Lagrange multiplier test for serial autocorrelation

Lag	chi2	df	Prob > chi2
1	38.3614	25	0.04264
2	23.0570	25	0.57424
3	26.8222	25	0.36483
4	20.2889	25	0.73151
5	28.3765	25	0.29081
6	43.4873	25	0.01237
7	29.8280	25	0.23080
8	23.0879	25	0.57243
9	37.4603	25	0.05218
10	22.1568	25	0.62668
11	21.0085	25	0.69214
12	51.9075	25	0.00123
13	32.0468	25	0.15666

H_0: no autocorrelation at lag order.

As seen in Table 32, we fail to reject the null hypothesis of no autocorrelation in the VAR model at most of the lagged levels. This implies that this VAR model is less misspecified than the corresponding VEC model in chapter 6.3.1. This is relatively good and may imply a valid model. But as in the other models, there are omitted and reasonably also correlated variables. For example, foreign countries monetary policies do have effects on an open economy as the Japanese, and may be correlated over time.

Table 33. Jarque-Bera test for normality of the residuals

Equation	chi2	df	Prob > chi2
EarlyPPI	42.759	2	0.00000
LatePPI	206.140	2	0.00000
EarlyProd	31.684	2	0.00000
LateProd	16.220	2	0.00030
Policy rate	9.804	2	0.00743
ALL	306.607	10	0.00000

H_0 for the individual equations: The innovation terms within the equations are normally distributed. H_0 for "ALL": All innovation terms have corresponding dimensional multivariate normal distributions. (Stata, 2019)

We can reject the null hypothesis of normally distributed residuals in all six equations. This means that this VAR model may not be free from the problems associated with non-normality either. Omitted variables are reasonably from an Austrian point of view.

7. Conclusions

The null hypothesis in this paper was that the monetary policies conducted by the Bank of Japan have not altered the Japanese structure of production, as the Austrian business cycle theory suggests that it would. The results in this research offer some support for the theory. But neither the VEC-, nor the VAR models have normal distributed residuals. None of the VEC models were found stable. Further, there are many omitted variables in the model, e.g. expectations, domestic polices which implies underfitted models. Furthermore, the ratios utilized to capture the structure of production neglects many aspects of the real structure of production. Nevertheless, I think the regression models can capture the signs of the possible impacts.

However, the results in chapter 6.1.1 and 6.1.2 gives no obvious evidence in favors of the Austrian business cycle theory. But nevertheless, the structure of production seems to be affected by this $TaylorGap$ variable. However, that we found the mirror results by using the plain short-term target Policy rate implies that we should not think of the impulse in Graph 1 and 2 as in terms of an increase in the Policy rate, but rather as either lowered inflation or lowered output compared to potential output. But anyhow, the results reveal no strong evidence of the theory. But the response in early to intermediate production is in line with the capital consumption and over-consumption version.

The results in chapter 6.2.1 and 6.2.2 offer no revelation of the Austrian business cycle theory. The magnitudes in Graph 3 and 4 are relatively small and partly opposed to the theory. The modest findings are maybe in line with Kumura's (2003) arguing that the monetary base had only a limited effect on the Japanese economy. Here we also saw that it had at maximum a limited effect on the structure of production. These modest findings may partly be due to interest rates already being very low when the monetary base exploded. If the monetary base could influence the structure of production thought other "channels" than through the interest rate I pass speculating about in this paper.

The results in chapter 6.3.1 and 6.3.2 is in line with the conventional Austrian business cycle theory where both early and late stages expand following a lower market rate. Since the short-term target Policy rate, and also market interest rates, have been low in Japan for the last two decades, generalization of the results less suitable. Also, Leijonhufvud (2008) argued that the lowered Policy rate of Japan had a limited effect on credit expansion in the banking system following the banking crash in the 1990s.

There are relatively few researches of this kind which makes comparisons frugal. The Austrian business cycle theory further implies different magnitude of the results depending on e.g. "marginal productivity structure" in the research sample, and of course for many other reasons. However, for the impulse responses, signs and patterns are comparable to the findings of Lester & Wolff (2013) and Cohen & Luther (2014). Luther & Wolff (2013) early to intermediate results for prices, using the Federal Fund Rate as the impulse variable, is very similar in both sign and pattern to the corresponding results suggested in this research using the short-term target Policy rate. Late to intermediate prices is further similar in both sign and pattern. Referring the response in production ratios the results in our researches are seemingly conflicting, where the result in this research support the conventional version of the Austrian business cycle theory.

Compared to Cohen & Luther's (2014) research for the US with a similar variable to $TaylorGap$, the results for prices are relatively hard to compare. But in both researches the price ratios fell below zero in the medium-long-term, following a shock in $TaylorGap$. But this paper seemingly suggests much larger effect in both early- and late to intermediate production following a shock.

One major drawback with this research is its neglect of foreign monetary policies. In open financial economies, foreign monetary policies will reasonably imply changes in the domestic time-discount rate and further the structure of production. This is something to be considered in future researches. To test the empirical relevance of the Austrian business cycle theory in closed and industrialized economies may be fruitful.

To conclude, even though we can't suggest very much with certainty, I believe the results with the Policy rate are too much in line with the Austrian business cycle theory not to reject the null hypothesis defined in chapter 3.4.

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Appendix 1

VECM with TaylorGap

```
Vector error-correction model

Sample:  1984m2 - 2017m12                         Number of obs     =        407
                                                  AIC               =  -23.41684
Log likelihood =  5061.326                        HQIC              =  -22.26305
Det(Sigma_ml)  =  1.09e-17                        SBIC              =  -20.50134

Equation           Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
D_EarlyPPI           58     .009848   0.4392   272.5437   0.0000
D_LatePPI            58     .003845   0.5652   452.4317   0.0000
D_EarlyProd          58     .022447   0.9283   4507.943   0.0000
D_LateProd           58      .02945   0.8978   3057.345   0.0000
D_TaylorGap          58      .27264   0.2683   127.6193   0.0000
----------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
D_EarlyPPI   |
        _ce1 |
         L1. |   .0126913   .0070253     1.81   0.071     -.001078    .0264607
             |
        _ce2 |
         L1. |    .013692   .0072712     1.88   0.060    -.0005593    .0279433
             |
    EarlyPPI |
         LD. |   .3731894   .0555641     6.72   0.000     .2642858    .4820931
        L2D. |  -.1343785   .0582666    -2.31   0.021     -.248579    -.020178
        L3D. |  -.0845961   .0607364    -1.39   0.164    -.2036373     .034445
        L4D. |   .0130707   .0612398     0.21   0.831    -.1069571    .1330984
        L5D. |  -.1101925   .0609635    -1.81   0.071    -.2296787    .0092938
        L6D. |  -.1734793   .0600439    -2.89   0.004    -.2911632   -.0557955
        L7D. |  -.0196346   .0600194    -0.33   0.744    -.1372704    .0980013
        L8D. |  -.0405112   .0602212    -0.67   0.501    -.1585426    .0775201
        L9D. |  -.0711918   .0600608    -1.19   0.236    -.1889088    .0465252
       L10D. |    .062116   .0606227     1.02   0.306    -.0567023    .1809343
       L11D. |  -.0899645    .058543    -1.54   0.124    -.2047066    .0247776
```

```
             |
     LatePPI |
         LD. |   .0562381    .136616     0.41   0.681    -.2115244    .3240005
        L2D. |   .0635193    .139071     0.46   0.648    -.2090549    .3360935
        L3D. |    .114272   .1399664     0.82   0.414    -.1600572    .3886012
        L4D. |   .2325104   .1434628     1.62   0.105    -.0486716    .5136923
        L5D. |  -.1968874   .1446199    -1.36   0.173    -.4803372    .0865623
        L6D. |    .452643       .143     3.17   0.002     .1723682    .7329179
        L7D. |   .2711408    .145263     1.87   0.062    -.0135694     .555851
        L8D. |  -.3020151   .1463615    -2.06   0.039    -.5888784   -.0151519
        L9D. |   .1277196   .1446148     0.88   0.377    -.1557202    .4111595
       L10D. |   .0062039   .1435624     0.04   0.966    -.2751731     .287581
       L11D. |  -.1346051   .1415765    -0.95   0.342      -.41209    .1428798
             |
   EarlyProd |
         LD. |   -.024645   .0349246    -0.71   0.480    -.0930959    .0438059
        L2D. |   .0516282   .0337595     1.53   0.126    -.0145392    .1177956
        L3D. |   .0003047   .0364997     0.01   0.993    -.0712334    .0718428
        L4D. |   .0041829    .036179     0.12   0.908    -.0667267    .0750925
        L5D. |  -.0175931   .0355877    -0.49   0.621    -.0873438    .0521576
        L6D. |  -.0327592   .0339884    -0.96   0.335    -.0993752    .0338567
        L7D. |    .053098   .0339658     1.56   0.118    -.0134737    .1196697
        L8D. |   .0267364   .0325658     0.82   0.412    -.0370914    .0905642
        L9D. |   .0142639   .0318124     0.45   0.654    -.0480874    .0766151
       L10D. |   .0366039   .0282908     1.29   0.196     -.018845    .0920528
       L11D. |  -.0441429   .0278991    -1.58   0.114    -.0988242    .0105384
             |
    LateProd |
         LD. |  -.0240291   .0348388    -0.69   0.490    -.0923119    .0442537
        L2D. |  -.0123284    .034425    -0.36   0.720    -.0798001    .0551433
        L3D. |  -.0104869   .0323998    -0.32   0.746    -.0739893    .0530156
        L4D. |  -.0253194   .0309202    -0.82   0.413    -.0859218     .035283
        L5D. |    .032715   .0306927     1.07   0.286    -.0274415    .0928715
        L6D. |    .025531   .0310428     0.82   0.411    -.0353117    .0863738
        L7D. |   .0112739   .0303296     0.37   0.710     -.048171    .0707189
        L8D. |  -.0344398   .0275395    -1.25   0.211    -.0884162    .0195367
        L9D. |  -.0248216   .0269585    -0.92   0.357    -.0776593    .0280162
       L10D. |   .0101334   .0266481     0.38   0.704     -.042096    .0623628
       L11D. |  -.0271438   .0231861    -1.17   0.242    -.0725878    .0183002
             |
   TaylorGap |
         LD. |   .0002648   .0020122     0.13   0.895     -.003679    .0042086
        L2D. |  -.0015628   .0019723    -0.79   0.428    -.0054285    .0023029
        L3D. |  -.0034968   .0019944    -1.75   0.080    -.0074057    .0004121
        L4D. |  -.0022178   .0019926    -1.11   0.266    -.0061231    .0016876
        L5D. |     .00025   .0019925     0.13   0.900    -.0036552    .0041553
        L6D. |  -.0018218   .0020092    -0.91   0.365    -.0057597    .0021161
        L7D. |   .0002632   .0020103     0.13   0.896     -.003677    .0042033
        L8D. |   .0010434   .0019954     0.52   0.601    -.0028675    .0049543
        L9D. |   .0008492   .0019747     0.43   0.667    -.0030211    .0047194
       L10D. |   .0003101   .0019565     0.16   0.874    -.0035246    .0041448
       L11D. |   .0002989   .0018865     0.16   0.874    -.0033986    .0039963
             |
       _cons |   .0003706   .0005473     0.68   0.498     -.000702    .0014432
-------------+----------------------------------------------------------------
D_LatePPI    |
        _ce1 |
         L1. |  -.0068547   .0027428    -2.50   0.012    -.0122304    -.001479
             |
        _ce2 |
         L1. |  -.0075465   .0028388    -2.66   0.008    -.0131104   -.0019826
             |
    EarlyPPI |
```

LD.	-.0601114	.0216929	-2.77	0.006	-.1026287	-.017594
L2D.	-.1011261	.022748	-4.45	0.000	-.1457114	-.0565408
L3D.	-.0146847	.0237123	-0.62	0.536	-.0611598	.0317905
L4D.	.0060292	.0239088	0.25	0.801	-.0408312	.0528895
L5D.	-.0145437	.0238009	-0.61	0.541	-.0611927	.0321052
L6D.	.0510798	.0234419	2.18	0.029	.0051345	.097025
L7D.	-.051784	.0234323	-2.21	0.027	-.0977105	-.0058574
L8D.	-.0044766	.0235111	-0.19	0.849	-.0505576	.0416043
L9D.	-.0485937	.0234485	-2.07	0.038	-.0945519	-.0026355
L10D.	.0196065	.0236679	0.83	0.407	-.0267816	.0659947
L11D.	.0219931	.0228559	0.96	0.336	-.0228036	.0667899
LatePPI						
LD.	.1735987	.0533366	3.25	0.001	.0690609	.2781366
L2D.	.101987	.0542951	1.88	0.060	-.0044294	.2084034
L3D.	.2638277	.0546447	4.83	0.000	.1567262	.3709293
L4D.	.0542494	.0560097	0.97	0.333	-.0555275	.1640264
L5D.	-.0277646	.0564614	-0.49	0.623	-.1384269	.0828978
L6D.	-.0249971	.055829	-0.45	0.654	-.13442	.0844257
L7D.	-.0265888	.0567125	-0.47	0.639	-.1377433	.0845656
L8D.	.136422	.0571414	2.39	0.017	.024427	.248417
L9D.	.0536982	.0564594	0.95	0.342	-.0569603	.1643567
L10D.	-.0361905	.0560485	-0.65	0.518	-.1460436	.0736627
L11D.	.0343585	.0552733	0.62	0.534	-.0739751	.1426921
EarlyProd						
LD.	.0110855	.013635	0.81	0.416	-.0156386	.0378096
L2D.	-.0011885	.0131801	-0.09	0.928	-.0270211	.0246441
L3D.	-.0172952	.0142499	-1.21	0.225	-.0452246	.0106342
L4D.	-.0068398	.0141248	-0.48	0.628	-.0345238	.0208442
L5D.	.0202476	.0138939	1.46	0.145	-.006984	.0474791
L6D.	.0024399	.0132695	0.18	0.854	-.0235678	.0284476
L7D.	.011998	.0132607	0.90	0.366	-.0139924	.0379884
L8D.	-.0163994	.0127141	-1.29	0.197	-.0413186	.0085198
L9D.	.0116947	.01242	0.94	0.346	-.012648	.0360374
L10D.	.0143228	.0110451	1.30	0.195	-.0073252	.0359707
L11D.	.0079626	.0108922	0.73	0.465	-.0133856	.0293109
LateProd						
LD.	-.0159583	.0136015	-1.17	0.241	-.0426168	.0107001
L2D.	.0003004	.0134399	0.02	0.982	-.0260414	.0266422
L3D.	.0122827	.0126493	0.97	0.332	-.0125095	.0370748
L4D.	.0199771	.0120716	1.65	0.098	-.0036829	.043637
L5D.	.012304	.0119828	1.03	0.305	-.0111819	.0357898
L6D.	.0198681	.0121195	1.64	0.101	-.0038857	.0436219
L7D.	-.0000444	.0118411	-0.00	0.997	-.0232525	.0231636
L8D.	.0131386	.0107518	1.22	0.222	-.0079345	.0342116
L9D.	-.0084682	.0105249	-0.80	0.421	-.0290967	.0121603
L10D.	-.006449	.0104038	-0.62	0.535	-.02684	.013942
L11D.	-.0076516	.0090522	-0.85	0.398	-.0253935	.0100903
TaylorGap						
LD.	.0004177	.0007856	0.53	0.595	-.0011221	.0019574
L2D.	.0006861	.00077	0.89	0.373	-.0008231	.0021953
L3D.	.0011813	.0007786	1.52	0.129	-.0003447	.0027074
L4D.	-.0002007	.0007779	-0.26	0.796	-.0017254	.001324
L5D.	.0002757	.0007779	0.35	0.723	-.001249	.0018003
L6D.	-.0009588	.0007844	-1.22	0.222	-.0024963	.0005786
L7D.	-.0005225	.0007849	-0.67	0.506	-.0020608	.0010158
L8D.	.0002713	.000779	0.35	0.728	-.0012556	.0017981
L9D.	.0001558	.0007709	0.20	0.840	-.0013552	.0016668
L10D.	.0001302	.0007638	0.17	0.865	-.001367	.0016273
L11D.	-.0004761	.0007365	-0.65	0.518	-.0019197	.0009674

```
             |
       _cons |   .0000977   .0002137     0.46   0.648    -.0003211    .0005164
-------------+----------------------------------------------------------------
D_EarlyProd  |
        _ce1 |
         L1. |  -.0384691   .0160129    -2.40   0.016    -.0698538   -.0070845
             |
        _ce2 |
         L1. |  -.0142171   .0165734    -0.86   0.391    -.0467003    .0182661
             |
    EarlyPPI |
         LD. |  -.1476665    .126648    -1.17   0.244     -.395892    .1005591
        L2D. |   .4195697   .1328079     3.16   0.002     .1592709    .6798684
        L3D. |   .0598864   .1384373     0.43   0.665    -.2114457    .3312185
        L4D. |   .4997106   .1395846     3.58   0.000     .2261298    .7732915
        L5D. |   .2058565   .1389549     1.48   0.138    -.0664901    .4782031
        L6D. |  -.2715915   .1368588    -1.98   0.047    -.5398299   -.0033531
        L7D. |   .0949395    .136803     0.69   0.488    -.1731895    .3630684
        L8D. |  -.1060791   .1372629    -0.77   0.440    -.3751094    .1629513
        L9D. |  -.1571983   .1368974    -1.15   0.251    -.4255123    .1111156
       L10D. |  -.1485475   .1381781    -1.08   0.282    -.4193716    .1222767
       L11D. |  -.2800281   .1334378    -2.10   0.036    -.5415613   -.0184949
             |
     LatePPI |
         LD. |  -.0981549   .3113907    -0.32   0.753    -.7084695    .5121596
        L2D. |  -.4888809   .3169865    -1.54   0.123    -1.110163    .1324011
        L3D. |  -.1340488   .3190274    -0.42   0.674     -.759331    .4912334
        L4D. |  -.6727945   .3269967    -2.06   0.040    -1.313696   -.0318928
        L5D. |    .385333    .329634     1.17   0.242    -.2607378    1.031404
        L6D. |   .6377464   .3259418     1.96   0.050    -.0010877    1.276581
        L7D. |   .3906774   .3310998     1.18   0.238    -.2582663    1.039621
        L8D. |   .2176831   .3336037     0.65   0.514    -.4361681    .8715344
        L9D. |  -.3810569   .3296225    -1.16   0.248    -1.027105    .2649913
       L10D. |  -.0951872   .3272236    -0.29   0.771    -.7365336    .5461593
       L11D. |  -.4029262   .3226973    -1.25   0.212    -1.035401    .2295488
             |
   EarlyProd |
         LD. |  -.2499386    .079604    -3.14   0.002    -.4059596   -.0939176
        L2D. |   -.556709   .0769485    -7.23   0.000    -.7075252   -.4058928
        L3D. |  -.0567148   .0831943    -0.68   0.495    -.2197725     .106343
        L4D. |  -.1506593   .0824634    -1.83   0.068    -.3122846    .0109659
        L5D. |   -.129873   .0811156    -1.60   0.109    -.2888568    .0291107
        L6D. |   .1056486   .0774701     1.36   0.173      -.04619    .2574873
        L7D. |  -.0193075   .0774186    -0.25   0.803    -.1710453    .1324302
        L8D. |   .1717588   .0742277     2.31   0.021     .0262753    .3172424
        L9D. |   .1313173   .0725105     1.81   0.070    -.0108007    .2734353
       L10D. |  -.2153868   .0644836    -3.34   0.001    -.3417723   -.0890013
       L11D. |  -.1779871   .0635909    -2.80   0.005    -.3026229   -.0533512
             |
    LateProd |
         LD. |  -.2012372   .0794085    -2.53   0.011    -.3568751   -.0455993
        L2D. |   .0742489   .0784653     0.95   0.344    -.0795402    .2280381
        L3D. |  -.1997389   .0738493    -2.70   0.007    -.3444808   -.0549969
        L4D. |   -.250985   .0704768    -3.56   0.000    -.3891169   -.1128531
        L5D. |  -.3095501   .0699582    -4.42   0.000    -.4466656   -.1724346
        L6D. |   .0088265   .0707563     0.12   0.901    -.1298533    .1475062
        L7D. |  -.2041518   .0691307    -2.95   0.003    -.3396455   -.0686581
        L8D. |  -.3946555   .0627711    -6.29   0.000    -.5176846   -.2716263
        L9D. |  -.3597001   .0614469    -5.85   0.000    -.4801339   -.2392664
       L10D. |  -.0930092   .0607395    -1.53   0.126    -.2120563     .026038
       L11D. |  -.0412959   .0528485    -0.78   0.435     -.144877    .0622851
             |
   TaylorGap |
```

LD.	.001374	.0045864	0.30	0.764	-.0076152	.0103633
L2D.	.0016905	.0044955	0.38	0.707	-.0071205	.0105016
L3D.	.0068998	.0045458	1.52	0.129	-.0020098	.0158094
L4D.	.0058334	.0045417	1.28	0.199	-.0030681	.014735
L5D.	.0176004	.0045415	3.88	0.000	.0086992	.0265017
L6D.	.0098975	.0045796	2.16	0.031	.0009217	.0188733
L7D.	.0188986	.0045821	4.12	0.000	.0099178	.0278794
L8D.	.0151723	.0045481	3.34	0.001	.0062581	.0240864
L9D.	.0119055	.0045009	2.65	0.008	.0030839	.0207271
L10D.	.0062339	.0044595	1.40	0.162	-.0025065	.0149744
L11D.	.0092306	.0042999	2.15	0.032	.0008029	.0176583
_cons	.003375	.0012474	2.71	0.007	.0009302	.0058198
D_LateProd						
_ce1						
L1.	-.0663724	.0210087	-3.16	0.002	-.1075487	-.0251961
_ce2						
L1.	-.0607817	.0217441	-2.80	0.005	-.1033993	-.018164
EarlyPPI						
LD.	-.1945549	.1661609	-1.17	0.242	-.5202243	.1311144
L2D.	.2456954	.1742426	1.41	0.159	-.0958139	.5872047
L3D.	-.0752651	.1816283	-0.41	0.679	-.43125	.2807198
L4D.	.4425961	.1831336	2.42	0.016	.0836608	.8015314
L5D.	.1637662	.1823074	0.90	0.369	-.1935498	.5210821
L6D.	-.1869184	.1795574	-1.04	0.298	-.5388444	.1650076
L7D.	.3330265	.1794841	1.86	0.064	-.0187559	.6848089
L8D.	-.1846966	.1800875	-1.03	0.305	-.5376617	.1682685
L9D.	.0790645	.179608	0.44	0.660	-.2729606	.4310897
L10D.	-.0784798	.1812883	-0.43	0.665	-.4337983	.2768387
L11D.	-.3901685	.175069	-2.23	0.026	-.7332973	-.0470396
LatePPI						
LD.	-.0568536	.4085414	-0.14	0.889	-.8575801	.7438728
L2D.	.3965697	.415883	0.95	0.340	-.418546	1.211685
L3D.	-.8458198	.4185606	-2.02	0.043	-1.666184	-.025456
L4D.	-.0071761	.4290163	-0.02	0.987	-.8480326	.8336803
L5D.	-.0613015	.4324764	-0.14	0.887	-.9089398	.7863367
L6D.	1.413945	.4276323	3.31	0.001	.5758009	2.252089
L7D.	-.1461927	.4343996	-0.34	0.736	-.9976002	.7052148
L8D.	.4040924	.4376846	0.92	0.356	-.4537537	1.261939
L9D.	-.4207294	.4324613	-0.97	0.331	-1.268338	.4268792
L10D.	-.4070301	.429314	-0.95	0.343	-1.24847	.4344098
L11D.	-.6226811	.4233755	-1.47	0.141	-1.452482	.2071196
EarlyProd						
LD.	.1552562	.1044397	1.49	0.137	-.0494417	.3599542
L2D.	-.2451738	.1009556	-2.43	0.015	-.4430431	-.0473045
L3D.	-.0206732	.10915	-0.19	0.850	-.2346033	.1932569
L4D.	-.1760902	.1081911	-1.63	0.104	-.3881409	.0359605
L5D.	-.2936141	.1064229	-2.76	0.006	-.5021991	-.0850291
L6D.	.3316602	.10164	3.26	0.001	.1324495	.5308709
L7D.	-.1136317	.1015725	-1.12	0.263	-.3127101	.0854466
L8D.	.1971139	.0973859	2.02	0.043	.0062409	.3879868
L9D.	.0580578	.095133	0.61	0.542	-.1283995	.2445152
L10D.	.180808	.0846018	2.14	0.033	.0149915	.3466244
L11D.	.0607283	.0834306	0.73	0.467	-.1027926	.2242492
LateProd						
LD.	-.6395049	.1041832	-6.14	0.000	-.8437002	-.4353096
L2D.	-.1956287	.1029457	-1.90	0.057	-.3973985	.0061411

L3D.	-.3730317	.0968895	-3.85	0.000	-.5629316	-.1831318
L4D.	-.4520105	.0924648	-4.89	0.000	-.6332382	-.2707828
L5D.	-.2602969	.0917844	-2.84	0.005	-.440191	-.0804027
L6D.	-.1709832	.0928315	-1.84	0.065	-.3529296	.0109631
L7D.	-.2438375	.0906987	-2.69	0.007	-.4216038	-.0660712
L8D.	-.5236106	.0823551	-6.36	0.000	-.6850236	-.3621976
L9D.	-.5101198	.0806177	-6.33	0.000	-.6681277	-.352112
L10D.	-.3325338	.0796896	-4.17	0.000	-.4887224	-.1763451
L11D.	-.2674261	.0693366	-3.86	0.000	-.4033234	-.1315288
TaylorGap						
LD.	.0015806	.0060174	0.26	0.793	-.0102132	.0133744
L2D.	.0156235	.0058981	2.65	0.008	.0040635	.0271835
L3D.	.0109379	.005964	1.83	0.067	-.0007514	.0226272
L4D.	.0117574	.0059586	1.97	0.048	.0000786	.0234361
L5D.	.0246332	.0059585	4.13	0.000	.0129548	.0363115
L6D.	.0159734	.0060083	2.66	0.008	.0041973	.0277495
L7D.	.0152518	.0060117	2.54	0.011	.003469	.0270345
L8D.	.0191651	.0059671	3.21	0.001	.0074698	.0308604
L9D.	.0226534	.0059051	3.84	0.000	.0110796	.0342273
L10D.	.0158836	.0058508	2.71	0.007	.0044162	.027351
L11D.	.0171678	.0056415	3.04	0.002	.0061107	.0282249
_cons	.0053143	.0016365	3.25	0.001	.0021067	.0085218
D_TaylorGap						
_ce1						
L1.	-.6323745	.1944914	-3.25	0.001	-1.013571	-.2511783
_ce2						
L1.	-.4845427	.2012993	-2.41	0.016	-.8790822	-.0900033
EarlyPPI						
LD.	-.5099498	1.538261	-0.33	0.740	-3.524885	2.504986
L2D.	1.013617	1.613079	0.63	0.530	-2.147959	4.175194
L3D.	-3.311452	1.681453	-1.97	0.049	-6.607039	-.0158653
L4D.	.4140085	1.695388	0.24	0.807	-2.908892	3.736909
L5D.	.9872322	1.68774	0.58	0.559	-2.320677	4.295141
L6D.	-2.160046	1.662281	-1.30	0.194	-5.418057	1.097965
L7D.	.4389047	1.661603	0.26	0.792	-2.817776	3.695586
L8D.	.6839435	1.667189	0.41	0.682	-2.583687	3.951574
L9D.	-.915092	1.662749	-0.55	0.582	-4.17402	2.343837
L10D.	3.369423	1.678305	2.01	0.045	.0800059	6.65884
L11D.	.1497781	1.620729	0.09	0.926	-3.026792	3.326348
LatePPI						
LD.	4.139649	3.782137	1.09	0.274	-3.273202	11.5525
L2D.	-2.211846	3.850103	-0.57	0.566	-9.757908	5.334217
L3D.	6.900941	3.874891	1.78	0.075	-.6937066	14.49559
L4D.	.278781	3.971686	0.07	0.944	-7.505581	8.063142
L5D.	-3.029487	4.003719	-0.76	0.449	-10.87663	4.817658
L6D.	2.822465	3.958873	0.71	0.476	-4.936785	10.58171
L7D.	-2.491273	4.021523	-0.62	0.536	-10.37331	5.390766
L8D.	4.307145	4.051935	1.06	0.288	-3.634501	12.24879
L9D.	1.119906	4.003579	0.28	0.780	-6.726965	8.966778
L10D.	-12.28432	3.974442	-3.09	0.002	-20.07409	-4.494559
L11D.	-7.712791	3.919466	-1.97	0.049	-15.3948	-.0307797
EarlyProd						
LD.	.4565266	.9668666	0.47	0.637	-1.438497	2.35155
L2D.	1.330012	.9346123	1.42	0.155	-.5017942	3.161819
L3D.	1.072642	1.010474	1.06	0.288	-.9078497	3.053134
L4D.	.8325822	1.001596	0.83	0.406	-1.130511	2.795675

L5D.	1.096582	.9852266	1.11	0.266	-.8344269	3.02759
L6D.	-.2760114	.9409483	-0.29	0.769	-2.120236	1.568213
L7D.	.0373137	.9403231	0.04	0.968	-1.805686	1.880313
L8D.	.0708546	.9015658	0.08	0.937	-1.696182	1.837891
L9D.	.9796897	.8807092	1.11	0.266	-.7464686	2.705848
L10D.	.1994828	.7832145	0.25	0.799	-1.335589	1.734555
L11D.	.0590519	.7723716	0.08	0.939	-1.454769	1.572872
LateProd						
LD.	-1.294719	.9644923	-1.34	0.179	-3.185089	.5956511
L2D.	-2.368951	.9530359	-2.49	0.013	-4.236867	-.5010354
L3D.	-1.628572	.8969698	-1.82	0.069	-3.3866	.1294564
L4D.	-1.09002	.8560075	-1.27	0.203	-2.767763	.5877241
L5D.	-1.720012	.8497086	-2.02	0.043	-3.38541	-.0546136
L6D.	-1.598764	.8594021	-1.86	0.063	-3.283161	.0856335
L7D.	-1.065804	.839658	-1.27	0.204	-2.711503	.5798958
L8D.	-.680924	.7624153	-0.89	0.372	-2.175231	.8133825
L9D.	-1.498626	.7463313	-2.01	0.045	-2.961408	-.0358433
L10D.	-.7030617	.7377386	-0.95	0.341	-2.149003	.7428795
L11D.	-.5516418	.6418948	-0.86	0.390	-1.809733	.706449
TaylorGap						
LD.	-.0643104	.0557066	-1.15	0.248	-.1734933	.0448725
L2D.	-.0491964	.0546025	-0.90	0.368	-.1562153	.0578224
L3D.	.1293124	.055213	2.34	0.019	.0210968	.2375279
L4D.	.090129	.055163	1.63	0.102	-.0179885	.1982465
L5D.	.1294979	.0551614	2.35	0.019	.0213836	.2376122
L6D.	.0773631	.0556231	1.39	0.164	-.0316561	.1863824
L7D.	.0441891	.0556544	0.79	0.427	-.0648916	.1532697
L8D.	.0497109	.0552413	0.90	0.368	-.0585601	.1579819
L9D.	.0458468	.0546677	0.84	0.402	-.0612999	.1529934
L10D.	.079311	.054165	1.46	0.143	-.0268505	.1854725
L11D.	.0700476	.0522268	1.34	0.180	-.032315	.1724103
_cons	-.0007567	.0151504	-0.05	0.960	-.030451	.0289376

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	3	37.69296	0.0000
_ce2	3	37.49339	0.0000

Identification: beta is exactly identified

Johansen normalization restrictions imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
EarlyPPI	1	.	.	.	.	.
LatePPI	0	(omitted)				
EarlyProd	7.810335	1.364323	5.72	0.000	5.13631	10.48436
LateProd	-11.14434	1.893534	-5.89	0.000	-14.8556	-7.433082
TaylorGap	.2964393	.0534572	5.55	0.000	.1916652	.4012135
_cons	2.818086	.	.	.	.	.
_ce2						
EarlyPPI	0	(omitted)				
LatePPI	1	.	.	.	.	.
EarlyProd	-5.307394	1.468963	-3.61	0.000	-8.186509	-2.428279

LateProd	8.943739	2.038762	4.39	0.000	4.947839	12.93964
TaylorGap	-.2051537	.0575572	-3.56	0.000	-.3179637	-.0923437
_cons	-5.034846	.	.	.	.	.

Appendix 2

VECM with LNMonetaryBase

Sample:	1984m2 - 2017m12	Number of obs	= 407
		AIC	= -29.08105
Log likelihood =	6206.994	HQIC	= -27.95455
Det(Sigma_ml) =	3.90e-20	SBIC	= -26.2345

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_EarlyPPI	57	.009859	0.4364	270.9991	0.0000
D_LatePPI	57	.003861	0.5604	446.1759	0.0000
D_EarlyProd	57	.022868	0.9254	4342.114	0.0000
D_LateProd	57	.031233	0.8847	2686.439	0.0000
D_LNMonetaryBase	57	.01541	0.3935	227.0905	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_EarlyPPI						
_ce1						
L1.	.0059966	.0046016	1.30	0.193	-.0030225	.0150156
EarlyPPI						
LD.	.3918773	.0534581	7.33	0.000	.2871014	.4966531
L2D.	-.1421191	.058018	-2.45	0.014	-.2558323	-.0284059
L3D.	-.049203	.0602104	-0.82	0.414	-.1672133	.0688073
L4D.	.019839	.0602697	0.33	0.742	-.0982873	.1379654
L5D.	-.1131746	.06014	-1.88	0.060	-.2310467	.0046976
L6D.	-.151994	.0589909	-2.58	0.010	-.2676141	-.036374
L7D.	-.0109531	.0591306	-0.19	0.853	-.1268469	.1049406
L8D.	-.0419796	.059686	-0.70	0.482	-.1589621	.0750029
L9D.	-.0582769	.0600554	-0.97	0.332	-.1759833	.0594296
L10D.	.0839961	.0603182	1.39	0.164	-.0342253	.2022176
L11D.	-.112037	.0579755	-1.93	0.053	-.2256669	.0015929
LatePPI						
LD.	.0077156	.1366349	0.06	0.955	-.2600839	.275515
L2D.	.071954	.1390386	0.52	0.605	-.2005566	.3444647
L3D.	.0962111	.1402238	0.69	0.493	-.1786225	.3710448
L4D.	.1879645	.1427371	1.32	0.188	-.0917952	.4677241
L5D.	-.2256972	.1430256	-1.58	0.115	-.5060222	.0546278
L6D.	.4437356	.1413803	3.14	0.002	.1666354	.7208359
L7D.	.2341016	.1455085	1.61	0.108	-.0510898	.519293
L8D.	-.3191681	.1460618	-2.19	0.029	-.6054441	-.0328921
L9D.	.1074366	.1462352	0.73	0.463	-.1791791	.3940524
L10D.	-.0310279	.1453161	-0.21	0.831	-.3158423	.2537864
L11D.	-.1413867	.1410919	-1.00	0.316	-.4179218	.1351483
EarlyProd						
LD.	.0256511	.0345102	0.74	0.457	-.0419877	.0932899

L2D.	.1083206	.0335265	3.23	0.001	.0426099	.1740313
L3D.	.0443298	.035523	1.25	0.212	-.0252941	.1139537
L4D.	.0495031	.035532	1.39	0.164	-.0201384	.1191447
L5D.	.0182486	.0351237	0.52	0.603	-.0505926	.0870897
L6D.	-.0037251	.0333789	-0.11	0.911	-.0691466	.0616965
L7D.	.0824907	.0333839	2.47	0.013	.0170595	.147922
L8D.	.0481621	.0319528	1.51	0.132	-.0144643	.1107885
L9D.	.041622	.0312871	1.33	0.183	-.0196996	.1029436
L10D.	.049565	.0277145	1.79	0.074	-.0047544	.1038844
L11D.	-.0387469	.0275549	-1.41	0.160	-.0927536	.0152598
LateProd						
LD.	-.0794578	.031444	-2.53	0.012	-.1410869	-.0178287
L2D.	-.067795	.0314055	-2.16	0.031	-.1293488	-.0062413
L3D.	-.0588371	.0299945	-1.96	0.050	-.1176251	-.000049
L4D.	-.0677564	.0288964	-2.34	0.019	-.1243922	-.0111205
L5D.	-.0018645	.0285762	-0.07	0.948	-.0578728	.0541438
L6D.	-.0104339	.0292519	-0.36	0.721	-.0677665	.0468987
L7D.	-.0128212	.0285374	-0.45	0.653	-.0687535	.0431111
L8D.	-.0553693	.0264341	-2.09	0.036	-.1071791	-.0035595
L9D.	-.0463659	.0258047	-1.80	0.072	-.0969423	.0042105
L10D.	-.008009	.0254017	-0.32	0.753	-.0577954	.0417773
L11D.	-.0392003	.022542	-1.74	0.082	-.0833819	.0049812
LNMonetaryBase						
LD.	-.0102026	.0353445	-0.29	0.773	-.0794766	.0590713
L2D.	-.0385009	.0357246	-1.08	0.281	-.1085199	.0315181
L3D.	.0090938	.0356949	0.25	0.799	-.0608668	.0790545
L4D.	.0236425	.0360858	0.66	0.512	-.0470844	.0943694
L5D.	.0085924	.0359623	0.24	0.811	-.0618923	.0790772
L6D.	-.0407055	.0360452	-1.13	0.259	-.1113528	.0299418
L7D.	.0344265	.036028	0.96	0.339	-.036187	.10504
L8D.	-.0412202	.0359328	-1.15	0.251	-.1116471	.0292068
L9D.	-.0085323	.0354153	-0.24	0.810	-.077945	.0608803
L10D.	.0027527	.035196	0.08	0.938	-.0662302	.0717356
L11D.	-.021809	.0347521	-0.63	0.530	-.0899219	.046304
_cons	.0003036	.0008034	0.38	0.705	-.0012711	.0018783
D_LatePPI						
_ce1						
L1.	.0014146	.001802	0.78	0.432	-.0021173	.0049464
EarlyPPI						
LD.	-.0743688	.0209341	-3.55	0.000	-.1153989	-.0333388
L2D.	-.1183075	.0227198	-5.21	0.000	-.1628374	-.0737776
L3D.	-.0191255	.0235783	-0.81	0.417	-.0653381	.0270871
L4D.	.0030106	.0236015	0.13	0.898	-.0432475	.0492686
L5D.	-.0164395	.0235507	-0.70	0.485	-.0625981	.029719
L6D.	.0436274	.0231007	1.89	0.059	-.0016492	.088904
L7D.	-.0551592	.0231554	-2.38	0.017	-.100543	-.0097754
L8D.	-.0165347	.0233729	-0.71	0.479	-.0623449	.0292754
L9D.	-.0495061	.0235176	-2.11	0.035	-.0955997	-.0034124
L10D.	.0235104	.0236205	1.00	0.320	-.0227849	.0698057
L11D.	.0211872	.0227031	0.93	0.351	-.0233101	.0656845
LatePPI						
LD.	.1893235	.053506	3.54	0.000	.0844537	.2941933
L2D.	.1155924	.0544473	2.12	0.034	.0088777	.222307
L3D.	.2789999	.0549114	5.08	0.000	.1713755	.3866243
L4D.	.0580196	.0558956	1.04	0.299	-.0515338	.167573
L5D.	-.0347146	.0560086	-0.62	0.535	-.1444894	.0750602
L6D.	-.02224	.0553643	-0.40	0.688	-.130752	.0862719
L7D.	-.0405911	.0569809	-0.71	0.476	-.1522716	.0710893
L8D.	.146492	.0571976	2.56	0.010	.0343868	.2585971
L9D.	.0522912	.0572654	0.91	0.361	-.059947	.1645294
L10D.	-.0495756	.0569055	-0.87	0.384	-.1611084	.0619572
L11D.	.0209126	.0552513	0.38	0.705	-.087378	.1292033

EarlyProd						
LD.	.00226	.0135141	0.17	0.867	-.0242273	.0287472
L2D.	-.0083736	.0131289	-0.64	0.524	-.0341058	.0173586
L3D.	-.0245465	.0139108	-1.76	0.078	-.0518111	.0027181
L4D.	-.0114538	.0139143	-0.82	0.410	-.0387253	.0158177
L5D.	.0144342	.0137544	1.05	0.294	-.0125238	.0413923
L6D.	-.0060113	.0130711	-0.46	0.646	-.0316302	.0196077
L7D.	.0040283	.0130731	0.31	0.758	-.0215944	.0296511
L8D.	-.0233028	.0125127	-1.86	0.063	-.0478272	.0012216
L9D.	.0040871	.012252	0.33	0.739	-.0199264	.0281005
L10D.	.0119071	.0108529	1.10	0.273	-.0093643	.0331785
L11D.	.002523	.0107905	0.23	0.815	-.0186259	.023672
LateProd						
LD.	-.0147109	.0123134	-1.19	0.232	-.0388447	.009423
L2D.	-.0002508	.0122984	-0.02	0.984	-.0243551	.0238536
L3D.	.0144847	.0117458	1.23	0.218	-.0085366	.037506
L4D.	.0192125	.0113158	1.70	0.090	-.002966	.041391
L5D.	.0120186	.0111904	1.07	0.283	-.0099142	.0339514
L6D.	.0212538	.011455	1.86	0.064	-.0011975	.0437052
L7D.	.000905	.0111752	0.08	0.935	-.020998	.022808
L8D.	.0145779	.0103515	1.41	0.159	-.0057107	.0348665
L9D.	-.0071572	.0101051	-0.71	0.479	-.0269628	.0126484
L10D.	-.0072692	.0099472	-0.73	0.465	-.0267655	.012227
L11D.	-.0055474	.0088274	-0.63	0.530	-.0228488	.011754
LNMonetaryBase						
LD.	-.0124752	.0138408	-0.90	0.367	-.0396027	.0146524
L2D.	-.0184855	.0139897	-1.32	0.186	-.0459048	.0089338
L3D.	-.0005792	.013978	-0.04	0.967	-.0279757	.0268172
L4D.	-.0054298	.0141311	-0.38	0.701	-.0331264	.0222667
L5D.	.0196703	.0140828	1.40	0.162	-.0079314	.047272
L6D.	.0026445	.0141152	0.19	0.851	-.0250208	.0303099
L7D.	.0047716	.0141085	0.34	0.735	-.0228806	.0324237
L8D.	-.0202597	.0140712	-1.44	0.150	-.0478388	.0073194
L9D.	-.0003351	.0138686	-0.02	0.981	-.027517	.0268468
L10D.	-.0064783	.0137827	-0.47	0.638	-.0334919	.0205353
L11D.	.026486	.0136089	1.95	0.052	-.0001868	.0531589
_cons	-.0001193	.0003146	-0.38	0.705	-.0007359	.0004974
D_EarlyProd						
_ce1						
L1.	.0522401	.010674	4.89	0.000	.0313194	.0731608
EarlyPPI						
LD.	-.282927	.1240021	-2.28	0.023	-.5259666	-.0398873
L2D.	.2747594	.1345794	2.04	0.041	.0109885	.5385302
L3D.	-.0908535	.139665	-0.65	0.515	-.364592	.1828849
L4D.	.3973868	.1398024	2.84	0.004	.1233792	.6713944
L5D.	.0757001	.1395015	0.54	0.587	-.1977179	.3491181
L6D.	-.3681096	.1368361	-2.69	0.007	-.6363035	-.0999156
L7D.	.0420257	.1371601	0.31	0.759	-.2268031	.3108546
L8D.	-.3106565	.1384486	-2.24	0.025	-.5820108	-.0393022
L9D.	-.2345065	.1393055	-1.68	0.092	-.5075402	.0385272
L10D.	-.2224592	.1399149	-1.59	0.112	-.4966874	.0517691
L11D.	-.486054	.1344808	-3.61	0.000	-.7496316	-.2224764
LatePPI						
LD.	-.285993	.3169403	-0.90	0.367	-.9071845	.3351985
L2D.	-.5140672	.322516	-1.59	0.111	-1.146187	.1180524
L3D.	-.142726	.3252653	-0.44	0.661	-.7802342	.4947822
L4D.	-.5460611	.3310951	-1.65	0.099	-1.194996	.1028734
L5D.	.464019	.3317643	1.40	0.162	-.1862271	1.114265
L6D.	.8010846	.3279478	2.44	0.015	.1583188	1.44385
L7D.	.1910265	.3375237	0.57	0.571	-.4705077	.8525607
L8D.	.3524521	.3388072	1.04	0.298	-.3115978	1.016502

L9D.	-.3704567	.3392093	-1.09	0.275	-1.035295	.2943813
L10D.	-.1713934	.3370774	-0.51	0.611	-.832053	.4892662
L11D.	-.3163275	.3272789	-0.97	0.334	-.9577823	.3251273
EarlyProd						
LD.	-.2004247	.0800504	-2.50	0.012	-.3573206	-.0435288
L2D.	-.465991	.0777685	-5.99	0.000	-.6184145	-.3135675
L3D.	.0205514	.0823998	0.25	0.803	-.1409491	.182052
L4D.	-.0475477	.0824206	-0.58	0.564	-.2090891	.1139938
L5D.	-.0569616	.0814734	-0.70	0.484	-.2166465	.1027233
L6D.	.1834586	.0774263	2.37	0.018	.0317059	.3352114
L7D.	.0038655	.0774378	0.05	0.960	-.1479098	.1556408
L8D.	.2052516	.0741182	2.77	0.006	.0599826	.3505206
L9D.	.1200643	.0725741	1.65	0.098	-.0221782	.2623069
L10D.	-.213861	.0642869	-3.33	0.001	-.3398611	-.0878609
L11D.	-.1790434	.0639169	-2.80	0.005	-.3043181	-.0537687
LateProd						
LD.	-.1399579	.072938	-1.92	0.055	-.2829136	.0029979
L2D.	.1194838	.0728488	1.64	0.101	-.0232971	.2622648
L3D.	-.1528444	.0695756	-2.20	0.028	-.2892101	-.0164786
L4D.	-.2169132	.0670285	-3.24	0.001	-.3482866	-.0855399
L5D.	-.2466446	.0662858	-3.72	0.000	-.3765624	-.1167269
L6D.	.1097493	.067853	1.62	0.106	-.0232402	.2427388
L7D.	-.1050156	.0661959	-1.59	0.113	-.2347571	.0247259
L8D.	-.3432605	.0613169	-5.60	0.000	-.4634393	-.2230816
L9D.	-.2720283	.0598571	-4.54	0.000	-.389346	-.1547106
L10D.	-.0262458	.0589221	-0.45	0.656	-.1417309	.0892394
L11D.	-.003154	.0522888	-0.06	0.952	-.1056381	.0993302
LNMonetaryBase						
LD.	-.0161572	.0819856	-0.20	0.844	-.1768462	.1445317
L2D.	-.0999784	.0828674	-1.21	0.228	-.2623955	.0624386
L3D.	-.0519772	.0827983	-0.63	0.530	-.214259	.1103046
L4D.	.0261516	.0837052	0.31	0.755	-.1379076	.1902108
L5D.	-.0206025	.0834186	-0.25	0.805	-.1841	.142895
L6D.	.1195403	.083611	1.43	0.153	-.0443342	.2834148
L7D.	.0333097	.083571	0.40	0.690	-.1304864	.1971058
L8D.	-.2298981	.0833502	-2.76	0.006	-.3932616	-.0665346
L9D.	-.0375346	.0821498	-0.46	0.648	-.1985453	.123476
L10D.	-.1388377	.0816412	-1.70	0.089	-.2988516	.0211761
L11D.	-.0520393	.0806115	-0.65	0.519	-.210035	.1059564
_cons	-.0011425	.0018637	-0.61	0.540	-.0047952	.0025103
D_LateProd						
_ce1						
L1.	.0206328	.0145782	1.42	0.157	-.00794	.0492055
EarlyPPI						
LD.	-.3380167	.1693578	-2.00	0.046	-.669952	-.0060815
L2D.	.0310421	.183804	0.17	0.866	-.3292071	.3912913
L3D.	-.2638324	.1907497	-1.38	0.167	-.637695	.1100301
L4D.	.3322485	.1909373	1.74	0.082	-.0419817	.7064787
L5D.	-.1436759	.1905264	-0.75	0.451	-.5171009	.229749
L6D.	-.3804884	.1868861	-2.04	0.042	-.7467785	-.0141983
L7D.	.2586793	.1873286	1.38	0.167	-.1084779	.6258365
L8D.	-.4922966	.1890884	-2.60	0.009	-.862903	-.1216902
L9D.	-.1345309	.1902586	-0.71	0.480	-.5074309	.2383692
L10D.	-.1691714	.191091	-0.89	0.376	-.5437029	.2053601
L11D.	-.7067505	.1836693	-3.85	0.000	-1.066736	-.3467652
LatePPI						
LD.	-.1468824	.4328661	-0.34	0.734	-.9952844	.7015196
L2D.	.3331954	.4404812	0.76	0.449	-.530132	1.196523
L3D.	-.8576795	.4442361	-1.93	0.054	-1.728366	.0130073
L4D.	.0845158	.4521984	0.19	0.852	-.8017767	.9708084
L5D.	.2504153	.4531123	0.55	0.580	-.6376685	1.138499

L6D.	1.952869	.4478998	4.36	0.000	1.075001	2.830736
L7D.	-.2074311	.4609782	-0.45	0.653	-1.110932	.6960696
L8D.	.7482968	.4627313	1.62	0.106	-.1586398	1.655233
L9D.	-.2392165	.4632805	-0.52	0.606	-1.14723	.6687966
L10D.	-.3896391	.4603688	-0.85	0.397	-1.291945	.5126672
L11D.	-.4003457	.4469862	-0.90	0.370	-1.276423	.4757313
EarlyProd						
LD.	.0506436	.1093301	0.46	0.643	-.1636394	.2649267
L2D.	-.2860824	.1062136	-2.69	0.007	-.4942571	-.0779076
L3D.	-.065054	.1125388	-0.58	0.563	-.2856259	.1555179
L4D.	-.1608742	.1125673	-1.43	0.153	-.381502	.0597536
L5D.	-.2640589	.1112736	-2.37	0.018	-.4821511	-.0459667
L6D.	.4000405	.1057462	3.78	0.000	.1927818	.6072992
L7D.	-.1251955	.1057619	-1.18	0.237	-.3324849	.082094
L8D.	.1829582	.1012281	1.81	0.071	-.0154453	.3813617
L9D.	.0004169	.0991192	0.00	0.997	-.1938531	.1946869
L10D.	.1336917	.0878009	1.52	0.128	-.0383949	.3057783
L11D.	.0438432	.0872954	0.50	0.615	-.1272527	.2149392
LateProd						
LD.	-.4548983	.0996162	-4.57	0.000	-.6501423	-.2596542
L2D.	-.0096896	.0994943	-0.10	0.922	-.2046949	.1853158
L3D.	-.2025735	.095024	-2.13	0.033	-.3888172	-.0163299
L4D.	-.317921	.0915452	-3.47	0.001	-.4973463	-.1384958
L5D.	-.0999604	.0905309	-1.10	0.270	-.2773976	.0774768
L6D.	.0244896	.0926714	0.26	0.792	-.1571429	.2061221
L7D.	-.056985	.090408	-0.63	0.528	-.2341815	.1202115
L8D.	-.4097749	.0837445	-4.89	0.000	-.573911	-.2456388
L9D.	-.3474698	.0817507	-4.25	0.000	-.5076983	-.1872413
L10D.	-.1643801	.0804738	-2.04	0.041	-.3221057	-.0066544
L11D.	-.1875864	.0714143	-2.63	0.009	-.3275557	-.047617
LNMonetaryBase						
LD.	.0310374	.1119732	0.28	0.782	-.188426	.2505008
L2D.	.0094139	.1131774	0.08	0.934	-.2124097	.2312375
L3D.	-.0501797	.1130831	-0.44	0.657	-.2718185	.1714592
L4D.	.1029172	.1143217	0.90	0.368	-.1211493	.3269836
L5D.	-.111037	.1139303	-0.97	0.330	-.3343363	.1122623
L6D.	.0884415	.114193	0.77	0.439	-.1353727	.3122557
L7D.	.0912304	.1141384	0.80	0.424	-.1324767	.3149375
L8D.	-.180544	.1138369	-1.59	0.113	-.4036602	.0425722
L9D.	-.1140905	.1121974	-1.02	0.309	-.3339933	.1058123
L10D.	-.0373409	.1115028	-0.33	0.738	-.2558823	.1812005
L11D.	-.2029576	.1100965	-1.84	0.065	-.4187427	.0128276
_cons	.0026901	.0025453	1.06	0.291	-.0022987	.0076789
D_LNMonetaryBase						
_ce1						
L1.	.0012087	.0071927	0.17	0.867	-.0128886	.0153061
EarlyPPI						
LD.	.006401	.0835585	0.08	0.939	-.1573707	.1701726
L2D.	.0856632	.090686	0.94	0.345	-.0920782	.2634045
L3D.	-.0681971	.0941129	-0.72	0.469	-.2526551	.1162609
L4D.	.123562	.0942055	1.31	0.190	-.0610773	.3082014
L5D.	-.0003779	.0940028	-0.00	0.997	-.18462	.1838641
L6D.	-.0184563	.0922067	-0.20	0.841	-.1991781	.1622655
L7D.	.1609181	.092425	1.74	0.082	-.0202315	.3420678
L8D.	.0242583	.0932933	0.26	0.795	-.1585932	.2071097
L9D.	-.1094965	.0938706	-1.17	0.243	-.2934796	.0744865
L10D.	.0342512	.0942813	0.36	0.716	-.1505368	.2190392
L11D.	.1988303	.0906196	2.19	0.028	.0212191	.3764414
LatePPI						
LD.	.1297591	.2135694	0.61	0.543	-.2888293	.5483474
L2D.	.0311195	.2173266	0.14	0.886	-.3948327	.4570718

```
         L3D. |  -.0636821   .2191792    -0.29   0.771    -.4932654    .3659012
         L4D. |   .0530713   .2231076     0.24   0.812    -.3842117    .4903542
         L5D. |   .1051108   .2235586     0.47   0.638    -.3330559    .5432775
         L6D. |  -.1667467   .2209868    -0.75   0.451    -.5998729    .2663795
         L7D. |  -.0219243   .2274395    -0.10   0.923    -.4676975    .4238489
         L8D. |  -.2466628   .2283044    -1.08   0.280    -.6941312    .2008057
         L9D. |   .3564966   .2285754     1.56   0.119    -.0915029    .8044961
        L10D. |  -.0607746   .2271388    -0.27   0.789    -.5059584    .3844093
        L11D. |  -.0374656   .2205361    -0.17   0.865    -.4697083    .3947771
              |
    EarlyProd |
          LD. |  -.0334825   .0539418    -0.62   0.535    -.1392064    .0722415
         L2D. |  -.0375737   .0524041    -0.72   0.473    -.1402839    .0651364
         L3D. |   .0073455   .0555249     0.13   0.895    -.1014813    .1161722
         L4D. |   .0044375   .0555389     0.08   0.936    -.1044168    .1132918
         L5D. |  -.0373108   .0549006    -0.68   0.497    -.1449141    .0702924
         L6D. |  -.0391015   .0521735    -0.75   0.454    -.1413597    .0631568
         L7D. |  -.0464443   .0521813    -0.89   0.373    -.1487177    .0558291
         L8D. |  -.0439599   .0499444    -0.88   0.379    -.1418491    .0539293
         L9D. |  -.0297911   .0489039    -0.61   0.542    -.1256409    .0660587
        L10D. |  -.0084313   .0433196    -0.19   0.846    -.0933362    .0764736
        L11D. |  -.0309108   .0430702    -0.72   0.473    -.1153269    .0535052
              |
     LateProd |
          LD. |  -.0047297   .0491491    -0.10   0.923    -.1010601    .0916006
         L2D. |   .0387643    .049089     0.79   0.430    -.0574483    .1349769
         L3D. |  -.0124014   .0468834    -0.26   0.791    -.1042911    .0794883
         L4D. |    .001787    .045167     0.04   0.968    -.0867387    .0903126
         L5D. |    .017966   .0446665     0.40   0.688    -.0695788    .1055107
         L6D. |   .0299898   .0457226     0.66   0.512    -.0596249    .1196044
         L7D. |   .0524347   .0446059     1.18   0.240    -.0349912    .1398607
         L8D. |   .0539616   .0413182     1.31   0.192    -.0270206    .1349438
         L9D. |    .033394   .0403345     0.83   0.408    -.0456602    .1124483
        L10D. |   .0127522   .0397045     0.32   0.748    -.0650672    .0905716
        L11D. |   .0695292   .0352347     1.97   0.048     .0004705    .1385879
              |
LNMonetaryBase |
          LD. |   .1792938   .0552458     3.25   0.001      .071014    .2875736
         L2D. |   .0572889     .05584     1.03   0.305    -.0521554    .1667332
         L3D. |   .1821112   .0557935     3.26   0.001     .0727581    .2914644
         L4D. |   .0351497   .0564045     0.62   0.533    -.0754012    .1457006
         L5D. |   .0652284   .0562114     1.16   0.246     -.044944    .1754008
         L6D. |   .0054823   .0563411     0.10   0.922    -.1049441    .1159088
         L7D. |   .0356169   .0563141     0.63   0.527    -.0747567    .1459905
         L8D. |   .0670158   .0561654     1.19   0.233    -.0430663    .1770978
         L9D. |  -.0079492   .0553564    -0.14   0.886    -.1164458    .1005474
        L10D. |    .051609   .0550137     0.94   0.348    -.0562159     .159434
        L11D. |   .0479601   .0543199     0.88   0.377    -.0585049    .1544252
              |
        _cons |     .00209   .0012558     1.66   0.096    -.0003714    .0045514
------------------------------------------------------------------------------------

Cointegrating equations

Equation           Parms    chi2     P>chi2
-------------------------------------------
_ce1                   4   35.51103   0.0000
-------------------------------------------

Identification:  beta is exactly identified

                 Johansen normalization restriction imposed
------------------------------------------------------------------------------
        beta |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
_ce1         |
   EarlyPPI |          1          .        .       .            .           .
     LatePPI |  -.5101993   .3703164    -1.38   0.168    -1.236006    .2156075
```

```
     EarlyProd |   -5.52875   1.078293    -5.13   0.000    -7.642166   -3.415333
      LateProd |   5.660978   .9724032     5.82   0.000     3.755103    7.566854
LNMonetaryBase |   .3885394   .0891778     4.36   0.000     .2137541    .5633246
         _cons |  -6.240928          .        .       .            .           .
-------------------------------------------------------------------------------
```

Appendix 3

VECM with Policy rate

```
Vector error-correction model

Sample:  1984m2 - 2017m12                        Number of obs     =        407
                                                 AIC               =  -23.65416
Log likelihood =  5102.621                       HQIC              =  -22.52766
Det(Sigma_ml)  =  8.87e-18                       SBIC              =   -20.8076

Equation           Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
D_EarlyPPI           57     .009817   0.4411   276.2238   0.0000
D_LatePPI            57       .0038   0.5740    471.601   0.0000
D_EarlyProd          57     .023191   0.9233   4212.574   0.0000
D_LateProd           57      .02978   0.8952    2989.88   0.0000
D_PolicyRate         57     .249979   0.2984   148.8915   0.0000
----------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
D_EarlyPPI   |
        _ce1 |
         L1. |   .0063928   .0047704     1.34   0.180     -.002957    .0157426
             |
    EarlyPPI |
         LD. |   .3731884   .0551554     6.77   0.000     .2650859     .481291
        L2D. |   -.123829    .058572    -2.11   0.035    -.2386279     -.00903
        L3D. |   -.073997   .0603062    -1.23   0.220    -.1921951     .044201
        L4D. |   .0150238   .0609658     0.25   0.805    -.1044669    .1345146
        L5D. |  -.0996943   .0608929    -1.64   0.102    -.2190423    .0196537
        L6D. |  -.1666294   .0596505    -2.79   0.005    -.2835422   -.0497165
        L7D. |  -.0322587     .06013    -0.54   0.592    -.1501114     .085594
        L8D. |  -.0388266   .0602917    -0.64   0.520    -.1569962    .0793431
        L9D. |  -.0671571   .0601806    -1.12   0.264     -.185109    .0507947
       L10D. |   .0443519   .0608239     0.73   0.466    -.0748608    .1635646
       L11D. |  -.0846365   .0587106    -1.44   0.149    -.1997072    .0304343
             |
     LatePPI |
         LD. |   .0444353   .1366843     0.33   0.745     -.223461    .3123317
        L2D. |    .094493   .1395831     0.68   0.498    -.1790849    .3680708
        L3D. |   .1139143   .1398684     0.81   0.415    -.1602227    .3880512
        L4D. |   .2483938   .1447876     1.72   0.086    -.0353847    .5321723
        L5D. |  -.2401647   .1461021    -1.64   0.100    -.5265196    .0461902
        L6D. |    .395132    .143455     2.75   0.006     .1139653    .6762987
        L7D. |   .2550453   .1461095     1.75   0.081    -.0313241    .5414147
        L8D. |  -.2841947   .1477268    -1.92   0.054    -.5737338    .0053444
        L9D. |   .1317122   .1451504     0.91   0.364    -.1527774    .4162018
       L10D. |   .0082358   .1440041     0.06   0.954     -.274007    .2904786
       L11D. |  -.1751353   .1435224    -1.22   0.222    -.4564339    .1061634
```

EarlyProd						
LD.	-.0148439	.03091	-0.48	0.631	-.0754262	.0457385
L2D.	.0591187	.0307922	1.92	0.055	-.0012329	.1194703
L3D.	.0057605	.0352835	0.16	0.870	-.0633938	.0749149
L4D.	.0092908	.0349387	0.27	0.790	-.0591877	.0777694
L5D.	-.0158698	.0345084	-0.46	0.646	-.0835049	.0517654
L6D.	-.0230001	.0328527	-0.70	0.484	-.0873902	.04139
L7D.	.0656344	.0329614	1.99	0.046	.0010312	.1302375
L8D.	.0382674	.0321026	1.19	0.233	-.0246526	.1011874
L9D.	.0246987	.0311775	0.79	0.428	-.0364082	.0858055
L10D.	.0446365	.0278403	1.60	0.109	-.0099295	.0992024
L11D.	-.0489917	.0277302	-1.77	0.077	-.1033419	.0053586
LateProd						
LD.	-.0490774	.0238072	-2.06	0.039	-.0957386	-.0024162
L2D.	-.0327997	.0254071	-1.29	0.197	-.0825967	.0169972
L3D.	-.0308622	.0264089	-1.17	0.243	-.0826226	.0208982
L4D.	-.0439107	.0261986	-1.68	0.094	-.0952591	.0074377
L5D.	.0221254	.0266711	0.83	0.407	-.0301489	.0743997
L6D.	.0035725	.0267974	0.13	0.894	-.0489494	.0560944
L7D.	-.0104591	.02725	-0.38	0.701	-.0638682	.04295
L8D.	-.0519772	.0254098	-2.05	0.041	-.1017795	-.0021748
L9D.	-.0415318	.0250491	-1.66	0.097	-.0906271	.0075634
L10D.	-.0028105	.0249823	-0.11	0.910	-.051775	.046154
L11D.	-.0283974	.0223887	-1.27	0.205	-.0722784	.0154836
PolicyRate						
LD.	.0001485	.0021842	0.07	0.946	-.0041325	.0044295
L2D.	.0001718	.0021258	0.08	0.936	-.0039948	.0043383
L3D.	.0029102	.0021581	1.35	0.177	-.0013196	.0071401
L4D.	.0028835	.0021967	1.31	0.189	-.001422	.007189
L5D.	.0004073	.0022074	0.18	0.854	-.0039191	.0047337
L6D.	.0014238	.0022045	0.65	0.518	-.002897	.0057445
L7D.	-.0006623	.0022268	-0.30	0.766	-.0050267	.0037021
L8D.	-.0039629	.0022077	-1.80	0.073	-.0082898	.0003641
L9D.	-.0031343	.0021486	-1.46	0.145	-.0073454	.0010768
L10D.	-.000489	.0021503	-0.23	0.820	-.0047034	.0037255
L11D.	.0001907	.0020987	0.09	0.928	-.0039226	.004304
_cons	.0002031	.0006116	0.33	0.740	-.0009957	.0014018
D_LatePPI						
_ce1						
L1.	-.003939	.0018467	-2.13	0.033	-.0075584	-.0003196
EarlyPPI						
LD.	-.0618825	.0213512	-2.90	0.004	-.10373	-.0200349
L2D.	-.0967104	.0226738	-4.27	0.000	-.1411502	-.0522707
L3D.	-.0091862	.0233451	-0.39	0.694	-.0549418	.0365694
L4D.	.0073954	.0236004	0.31	0.754	-.0388606	.0536514
L5D.	-.0146825	.0235723	-0.62	0.533	-.0608833	.0315183
L6D.	.0567828	.0230913	2.46	0.014	.0115247	.1020409
L7D.	-.0485757	.0232769	-2.09	0.037	-.0941976	-.0029537
L8D.	-.0003291	.0233395	-0.01	0.989	-.0460738	.0454155
L9D.	-.044347	.0232965	-1.90	0.057	-.0900073	.0013133
L10D.	.0213977	.0235455	0.91	0.363	-.0247507	.0675461
L11D.	.0208901	.0227275	0.92	0.358	-.0236549	.0654351
LatePPI						
LD.	.1755888	.0529118	3.32	0.001	.0718835	.2792941
L2D.	.1055903	.054034	1.95	0.051	-.0003143	.2114949
L3D.	.2817951	.0541444	5.20	0.000	.175674	.3879162

L4D.	.0529429	.0560487	0.94	0.345	-.0569105	.1627964
L5D.	-.0339013	.0565575	-0.60	0.549	-.144752	.0769495
L6D.	-.0391011	.0555328	-0.70	0.481	-.1479435	.0697412
L7D.	-.041491	.0565604	-0.73	0.463	-.1523474	.0693653
L8D.	.1519153	.0571865	2.66	0.008	.0398319	.2639988
L9D.	.0560224	.0561891	1.00	0.319	-.0541063	.1661511
L10D.	-.0287025	.0557454	-0.51	0.607	-.1379615	.0805564
L11D.	.045804	.0555589	0.82	0.410	-.0630895	.1546974
EarlyProd						
LD.	.0048883	.0119655	0.41	0.683	-.0185638	.0283403
L2D.	-.0050731	.01192	-0.43	0.670	-.0284358	.0182896
L3D.	-.020086	.0136586	-1.47	0.141	-.0468563	.0066843
L4D.	-.0124685	.0135251	-0.92	0.357	-.0389772	.0140402
L5D.	.0126762	.0133585	0.95	0.343	-.013506	.0388584
L6D.	-.0046815	.0127176	-0.37	0.713	-.0296076	.0202445
L7D.	.0094842	.0127597	0.74	0.457	-.0155243	.0344927
L8D.	-.0149732	.0124272	-1.20	0.228	-.0393301	.0093838
L9D.	.012169	.0120691	1.01	0.313	-.0114861	.035824
L10D.	.0152107	.0107772	1.41	0.158	-.0059123	.0363337
L11D.	.0068363	.0107346	0.64	0.524	-.0142033	.0278758
LateProd						
LD.	-.0026651	.009216	-0.29	0.772	-.0207281	.0153979
L2D.	.0098064	.0098353	1.00	0.319	-.0094705	.0290833
L3D.	.0204155	.0102231	2.00	0.046	.0003785	.0404524
L4D.	.0275717	.0101417	2.72	0.007	.0076942	.0474491
L5D.	.0221789	.0103246	2.15	0.032	.001943	.0424148
L6D.	.0301906	.0103735	2.91	0.004	.0098588	.0505223
L7D.	.0054253	.0105488	0.51	0.607	-.0152499	.0261005
L8D.	.0160344	.0098364	1.63	0.103	-.0032446	.0353133
L9D.	-.0061777	.0096967	-0.64	0.524	-.0251829	.0128276
L10D.	-.0053148	.0096709	-0.55	0.583	-.0242694	.0136398
L11D.	-.0062982	.0086669	-0.73	0.467	-.023285	.0106885
PolicyRate						
LD.	-.0010179	.0008455	-1.20	0.229	-.0026751	.0006393
L2D.	-.0012373	.0008229	-1.50	0.133	-.0028502	.0003757
L3D.	-.0022291	.0008354	-2.67	0.008	-.0038665	-.0005917
L4D.	.0007345	.0008504	0.86	0.388	-.0009322	.0024012
L5D.	.000714	.0008545	0.84	0.403	-.0009608	.0023888
L6D.	.0013688	.0008534	1.60	0.109	-.0003038	.0030414
L7D.	.0006993	.000862	0.81	0.417	-.0009901	.0023888
L8D.	-.0008369	.0008546	-0.98	0.327	-.0025119	.0008381
L9D.	-.0001921	.0008317	-0.23	0.817	-.0018222	.0014381
L10D.	-.0002338	.0008324	-0.28	0.779	-.0018652	.0013977
L11D.	.0012097	.0008124	1.49	0.136	-.0003826	.002802
_cons	.000223	.0002368	0.94	0.346	-.000241	.0006871
D_EarlyProd						
_ce1						
L1.	.0101436	.0112685	0.90	0.368	-.0119423	.0322295
EarlyPPI						
LD.	-.2598792	.1302874	-1.99	0.046	-.5152378	-.0045206
L2D.	.3583189	.138358	2.59	0.010	.0871422	.6294955
L3D.	-.0226811	.1424547	-0.16	0.873	-.3018872	.256525
L4D.	.444903	.1440127	3.09	0.002	.1626433	.7271626
L5D.	.0935858	.1438406	0.65	0.515	-.1883366	.3755082
L6D.	-.3715397	.1409057	-2.64	0.008	-.6477098	-.0953695
L7D.	.0598355	.1420385	0.42	0.674	-.2185549	.3382258
L8D.	-.1593113	.1424205	-1.12	0.263	-.4384502	.1198277

```
        L9D. |  -.1785424    .142158    -1.26   0.209    -.4571669    .1000822
       L10D. |  -.1597497   .1436776    -1.11   0.266    -.4413525    .1218531
       L11D. |  -.2922485   .1386856    -2.11   0.035    -.5640672   -.0204298
             |
     LatePPI |
         LD. |  -.0625957   .3228741    -0.19   0.846    -.6954174     .570226
        L2D. |  -.4569863   .3297215    -1.39   0.166    -1.103229     .189256
        L3D. |  -.1083791   .3303954    -0.33   0.743    -.7559422    .5391841
        L4D. |  -.7019408   .3420156    -2.05   0.040    -1.372279   -.0316024
        L5D. |   .4812293   .3451207     1.39   0.163    -.1951949    1.157653
        L6D. |   .8032362   .3388678     2.37   0.018     .1390676    1.467405
        L7D. |    .462925   .3451382     1.34   0.180    -.2135335    1.139384
        L8D. |   .3423618   .3489584     0.98   0.327    -.3415841    1.026308
        L9D. |  -.4503528   .3428726    -1.31   0.189    -1.122371    .2216652
       L10D. |  -.0921237   .3401647    -0.27   0.787    -.7588343    .5745869
       L11D. |  -.3971153   .3390268    -1.17   0.241    -1.061596     .267365
             |
   EarlyProd |
         LD. |  -.4101099   .0730151    -5.62   0.000    -.5532169   -.2670029
        L2D. |  -.6948208    .072737    -9.55   0.000    -.8373826   -.5522589
        L3D. |  -.1328853   .0833462    -1.59   0.111    -.2962409    .0304703
        L4D. |  -.2170813   .0825317    -2.63   0.009    -.3788405   -.0553221
        L5D. |  -.1910235   .0815152    -2.34   0.019    -.3507905   -.0312566
        L6D. |   .0655278   .0776043     0.84   0.398    -.0865738    .2176294
        L7D. |    -.08128    .077861    -1.04   0.297    -.2338848    .0713248
        L8D. |   .1019663   .0758325     1.34   0.179    -.0466625    .2505952
        L9D. |   .0722022   .0736472     0.98   0.327    -.0721437    .2165481
       L10D. |  -.2632141    .065764    -4.00   0.000    -.3921091    -.134319
       L11D. |  -.1981556    .065504    -3.03   0.002    -.3265411   -.0697701
             |
    LateProd |
         LD. |    .060878    .056237     1.08   0.279    -.0493446    .1711006
        L2D. |   .3222811   .0600163     5.37   0.000     .2046514    .4399108
        L3D. |  -.0088478   .0623827    -0.14   0.887    -.1311156      .11342
        L4D. |  -.0989876   .0618861    -1.60   0.110    -.2202822    .0223069
        L5D. |  -.1568003   .0630021    -2.49   0.013    -.2802821   -.0333186
        L6D. |   .1661611   .0633004     2.62   0.009     .0420945    .2902277
        L7D. |  -.0746111   .0643697    -1.16   0.246    -.2007734    .0515512
        L8D. |  -.2735327   .0600227    -4.56   0.000    -.3911751   -.1558903
        L9D. |  -.2536248   .0591706    -4.29   0.000    -.3695971   -.1376526
       L10D. |   .0111796    .059013     0.19   0.850    -.1044837    .1268429
       L11D. |   .0282236   .0528863     0.53   0.594    -.0754315    .1318788
             |
  PolicyRate |
         LD. |   .0042944   .0051596     0.83   0.405    -.0058181     .014407
        L2D. |   .0070987   .0050216     1.41   0.157    -.0027435    .0169409
        L3D. |  -.0034283   .0050979    -0.67   0.501      -.01342    .0065633
        L4D. |  -.0023968   .0051891    -0.46   0.644    -.0125673    .0077736
        L5D. |  -.0123491   .0052143    -2.37   0.018    -.0225688   -.0021293
        L6D. |  -.0068362   .0052075    -1.31   0.189    -.0170427    .0033702
        L7D. |  -.0129109     .00526    -2.45   0.014    -.0232203   -.0026014
        L8D. |  -.0107738   .0052149    -2.07   0.039    -.0209948   -.0005527
        L9D. |  -.0068427   .0050753    -1.35   0.178    -.0167902    .0031047
       L10D. |  -.0001139   .0050794    -0.02   0.982    -.0100692    .0098415
       L11D. |  -.0081153   .0049575    -1.64   0.102    -.0178318    .0016011
             |
       _cons |   .0020961   .0014447     1.45   0.147    -.0007355    .0049277
-------------+----------------------------------------------------------------
D_LateProd   |
        _ce1 |
         L1. |  -.0419137   .0144704    -2.90   0.004    -.0702752   -.0135522
             |
    EarlyPPI |
```

LD.	-.2510147	.1673078	-1.50	0.134	-.5789319	.0769024
L2D.	.217739	.1776715	1.23	0.220	-.1304908	.5659688
L3D.	-.1538195	.1829323	-0.84	0.400	-.5123603	.2047213
L4D.	.4194348	.184933	2.27	0.023	.0569728	.7818967
L5D.	.1185822	.184712	0.64	0.521	-.2434467	.4806111
L6D.	-.2559133	.1809432	-1.41	0.157	-.6105555	.0987289
L7D.	.312312	.1823978	1.71	0.087	-.0451812	.6698052
L8D.	-.1841249	.1828883	-1.01	0.314	-.5425795	.1743297
L9D.	.1074029	.1825513	0.59	0.556	-.2503911	.4651969
L10D.	-.0552504	.1845026	-0.30	0.765	-.4168689	.3063681
L11D.	-.3972472	.1780922	-2.23	0.026	-.7463016	-.0481929
LatePPI						
LD.	-.1236112	.4146168	-0.30	0.766	-.9362451	.6890228
L2D.	.2326032	.4234099	0.55	0.583	-.5972649	1.062471
L3D.	-.9297477	.4242752	-2.19	0.028	-1.761312	-.0981836
L4D.	-.0394509	.4391972	-0.09	0.928	-.9002617	.8213599
L5D.	.0787906	.4431846	0.18	0.859	-.7898353	.9474165
L6D.	1.542669	.435155	3.55	0.000	.6897807	2.395557
L7D.	-.1903786	.4432071	-0.43	0.668	-1.059049	.6782914
L8D.	.3510541	.4481128	0.78	0.433	-.5272308	1.229339
L9D.	-.6623971	.4402977	-1.50	0.132	-1.525365	.2005706
L10D.	-.4638114	.4368204	-1.06	0.288	-1.319964	.3923409
L11D.	-.614839	.4353592	-1.41	0.158	-1.468127	.2384492
EarlyProd						
LD.	.0609618	.0937619	0.65	0.516	-.1228081	.2447318
L2D.	-.315686	.0934047	-3.38	0.001	-.4987558	-.1326161
L3D.	-.0231166	.1070285	-0.22	0.829	-.2328887	.1866554
L4D.	-.1585251	.1059826	-1.50	0.135	-.3662472	.049197
L5D.	-.3007119	.1046773	-2.87	0.004	-.5058756	-.0955482
L6D.	.3268257	.0996551	3.28	0.001	.1315054	.5221461
L7D.	-.1534233	.0999848	-1.53	0.125	-.3493898	.0425433
L8D.	.1503532	.0973798	1.54	0.123	-.0405077	.341214
L9D.	.0339573	.0945736	0.36	0.720	-.1514036	.2193181
L10D.	.1516039	.0844504	1.80	0.073	-.0139159	.3171237
L11D.	.0780381	.0841166	0.93	0.354	-.0868274	.2429035
LateProd						
LD.	-.3841737	.0722164	-5.32	0.000	-.5257153	-.242632
L2D.	.0380113	.0770695	0.49	0.622	-.1130422	.1890647
L3D.	-.2053462	.0801083	-2.56	0.010	-.3623557	-.0483368
L4D.	-.3293803	.0794707	-4.14	0.000	-.48514	-.1736207
L5D.	-.1364274	.0809037	-1.69	0.092	-.2949957	.022141
L6D.	-.0251262	.0812869	-0.31	0.757	-.1844455	.1341932
L7D.	-.1095488	.08266	-1.33	0.185	-.2715594	.0524617
L8D.	-.4004945	.0770778	-5.20	0.000	-.5515643	-.2494247
L9D.	-.4110119	.0759836	-5.41	0.000	-.5599369	-.2620868
L10D.	-.2450846	.0757811	-3.23	0.001	-.3936129	-.0965563
L11D.	-.2205107	.0679136	-3.25	0.001	-.3536188	-.0874026
PolicyRate						
LD.	.0030952	.0066256	0.47	0.640	-.0098907	.0160812
L2D.	-.0082256	.0064485	-1.28	0.202	-.0208643	.0044132
L3D.	-.008345	.0065464	-1.27	0.202	-.0211757	.0044857
L4D.	-.0111174	.0066635	-1.67	0.095	-.0241777	.001943
L5D.	-.0249558	.0066959	-3.73	0.000	-.0380794	-.0118321
L6D.	-.0155816	.0066871	-2.33	0.020	-.0286882	-.0024751
L7D.	-.0052327	.0067546	-0.77	0.439	-.0184715	.0080061
L8D.	-.0122392	.0066967	-1.83	0.068	-.0253646	.0008861
L9D.	-.0140458	.0065174	-2.16	0.031	-.0268197	-.0012719
L10D.	-.0116759	.0065226	-1.79	0.073	-.02446	.0011082
L11D.	-.0153004	.0063661	-2.40	0.016	-.0277777	-.0028231

```
             |
       _cons |   .0048738   .0018552     2.63   0.009     .0012376      .00851
-------------+----------------------------------------------------------------
D_PolicyRate |
        _ce1 |
         L1. |  -.0403106   .1214672    -0.33   0.740    -.2783818    .1977607
             |
    EarlyPPI |
         LD. |   2.466625   1.404409     1.76   0.079    -.2859663    5.219217
        L2D. |  -.3889593   1.491405    -0.26   0.794    -3.312059     2.53414
        L3D. |   3.852941   1.535565     2.51   0.012     .8432894    6.862592
        L4D. |   .4707812   1.552358     0.30   0.762    -2.571785    3.513348
        L5D. |   .2132272   1.550504     0.14   0.891    -2.825704    3.252158
        L6D. |   1.521169   1.518868     1.00   0.317    -1.455757    4.498095
        L7D. |  -.3580616   1.531078    -0.23   0.815    -3.358919    2.642796
        L8D. |  -.4558299   1.535195    -0.30   0.767    -3.464758    2.553098
        L9D. |   .0236609   1.532366     0.02   0.988    -2.979722    3.027043
       L10D. |  -3.259101   1.548746    -2.10   0.035    -6.294587   -.2236141
       L11D. |  -.5315872   1.494936    -0.36   0.722    -3.461608    2.398434
             |
     LatePPI |
         LD. |  -6.386914   3.480363    -1.84   0.066     -13.2083     .434472
        L2D. |   .2394841   3.554173     0.07   0.946    -6.726568    7.205536
        L3D. |  -6.913369   3.561437    -1.94   0.052    -13.89366    .0669195
        L4D. |  -3.327455   3.686695    -0.90   0.367    -10.55324    3.898335
        L5D. |   .4692992   3.720166     0.13   0.900    -6.822092    7.760691
        L6D. |  -2.782236   3.652764    -0.76   0.446    -9.941521     4.37705
        L7D. |   2.444799   3.720355     0.66   0.511    -4.846963     9.73656
        L8D. |  -5.274344   3.761534    -1.40   0.161    -12.64681    2.098127
        L9D. |  -.6756332   3.695933    -0.18   0.855    -7.919529    6.568262
       L10D. |   13.80926   3.666744     3.77   0.000     6.622577    20.99595
       L11D. |   6.124656   3.654478     1.68   0.094    -1.037989     13.2873
             |
   EarlyProd |
         LD. |   1.027197   .7870533     1.31   0.192    -.5153989    2.569793
        L2D. |   .3485222   .7840549     0.44   0.657    -1.188197    1.885242
        L3D. |  -.2311148   .8984154    -0.26   0.797    -1.991977    1.529747
        L4D. |   .0149807   .8896357     0.02   0.987    -1.728673    1.758635
        L5D. |   .1374368   .8786787     0.16   0.876    -1.584742    1.859615
        L6D. |    1.06716   .8365213     1.28   0.202    -.5723917    2.706712
        L7D. |   1.686152   .8392889     2.01   0.045     .0411763    3.331128
        L8D. |   .7053224   .8174222     0.86   0.388    -.8967957     2.30744
        L9D. |   .0955679   .7938667     0.12   0.904    -1.460382    1.651518
       L10D. |   .2426281   .7088912     0.34   0.732    -1.146773    1.632029
       L11D. |   .1826705   .7060887     0.26   0.796    -1.201238    1.566579
             |
    LateProd |
         LD. |  -1.148893   .6061969    -1.90   0.058    -2.337018    .0392307
        L2D. |   .0942283   .6469344     0.15   0.884     -1.17374    1.362197
        L3D. |   .1147548   .6724428     0.17   0.864    -1.203209    1.432718
        L4D. |   -.205693   .6670901    -0.31   0.758    -1.513166     1.10178
        L5D. |   .1169107   .6791193     0.17   0.863    -1.214139     1.44796
        L6D. |   .1693503   .6823356     0.25   0.804    -1.168003    1.506704
        L7D. |  -.2876336   .6938617    -0.41   0.678    -1.647578     1.07231
        L8D. |  -.4083217   .6470043    -0.63   0.528    -1.676427    .8597834
        L9D. |   .2733838   .6378187     0.43   0.668    -.9767178    1.523485
       L10D. |  -.0741772   .6361196    -0.12   0.907    -1.320949    1.172594
       L11D. |  -.0059369   .5700778    -0.01   0.992    -1.123269    1.111395
             |
  PolicyRate |
         LD. |   -.079486   .0556164    -1.43   0.153    -.1884922    .0295202
        L2D. |  -.0511807   .0541296    -0.95   0.344    -.1572727    .0549113
        L3D. |   .1565373   .0549516     2.85   0.004     .0488342    .2642404
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
L4D.	.0348565	.0559349	0.62	0.533	-.0747739	.1444869
L5D.	.0155312	.0562061	0.28	0.782	-.0946308	.1256932
L6D.	.0599556	.056133	1.07	0.285	-.0500631	.1699742
L7D.	.0155459	.0566995	0.27	0.784	-.095583	.1266748
L8D.	.0427639	.0562133	0.76	0.447	-.0674122	.15294
L9D.	.0483535	.0547084	0.88	0.377	-.0588729	.1555799
L10D.	.0819827	.054752	1.50	0.134	-.0253293	.1892948
L11D.	.0913323	.053438	1.71	0.087	-.0134043	.1960689
_cons	-.0045297	.0155732	-0.29	0.771	-.0350527	.0259933

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	4	28.90816	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
EarlyPPI	1	.	.	.	.	.
LatePPI	1.929909	.4516656	4.27	0.000	1.04466	2.815157
EarlyProd	.341286	.5449268	0.63	0.531	-.7267509	1.409323
LateProd	2.311991	.7654066	3.02	0.003	.8118221	3.812161
PolicyRate	.0530645	.0256884	2.07	0.039	.0027161	.1034129
_cons	-5.718363	.	.	.	.	.

Appendix 4

VAR with TaylorGap

Sample: 1984m3 - 2017m12		Number of obs =	406
Log likelihood =	5186.745	AIC =	-23.92485
FPE =	2.84e-17	HQIC =	-22.63604
Det(Sigma_ml) =	5.51e-18	SBIC =	-20.66846

Equation	Parameters	RMSE	R-square	chi2	P>chi2
EarlyPPI	66	.0098	0.9605	9875.666	0.0000
LatePPI	66	.003793	0.9993	610626.1	0.0000
EarlyProd	66	.019509	0.9886	35334.49	0.0000
LateProd	66	.025474	0.9636	10734.94	0.0000
TaylorGap	66	.266703	0.9705	13357.42	0.0000

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
EarlyPPI						
EarlyPPI						
L1.	1.388215	.0507941	27.33	0.000	1.288661	1.48777
L2.	-.553242	.0862479	-6.41	0.000	-.7222847	-.3841993
L3.	.0840336	.0886936	0.95	0.343	-.0898026	.2578698
L4.	.0710225	.0879375	0.81	0.419	-.1013318	.2433767
L5.	-.1285245	.0883122	-1.46	0.146	-.3016132	.0445642
L6.	-.0252961	.087759	-0.29	0.773	-.1973006	.1467085

L7.	.114622	.0874331	1.31	0.190	-.0567439	.2859878
L8.	-.017325	.0868776	-0.20	0.842	-.187602	.152952
L9.	-.0211738	.0855958	-0.25	0.805	-.1889384	.1465908
L10.	.1248048	.0862401	1.45	0.148	-.0442226	.2938322
L11.	-.1576966	.087302	-1.81	0.071	-.3288055	.0134122
L12.	.1619286	.0850007	1.91	0.057	-.0046696	.3285269
L13.	-.0856042	.0544145	-1.57	0.116	-.1922547	.0210462
LatePPI						
L1.	.0415357	.1267397	0.33	0.743	-.2068695	.2899409
L2.	-.0026438	.1928003	-0.01	0.989	-.3805255	.3752379
L3.	.106717	.1945364	0.55	0.583	-.2745674	.4880013
L4.	.149832	.1980832	0.76	0.449	-.238404	.5380679
L5.	-.4942851	.2005881	-2.46	0.014	-.8874305	-.1011397
L6.	.6422774	.2007062	3.20	0.001	.2489004	1.035654
L7.	-.2073846	.2018343	-1.03	0.304	-.6029726	.1882034
L8.	-.4947164	.2010091	-2.46	0.014	-.888687	-.1007457
L9.	.4413209	.2036453	2.17	0.030	.0421834	.8404585
L10.	-.1531031	.203967	-0.75	0.453	-.5528711	.2466649
L11.	-.106503	.203855	-0.52	0.601	-.5060514	.2930455
L12.	.0541969	.2017911	0.27	0.788	-.3413063	.4497002
L13.	.0491833	.1330409	0.37	0.712	-.2115721	.3099388
EarlyProd						
L1.	.0223975	.0293595	0.76	0.446	-.0351461	.079941
L2.	.0947713	.0325165	2.91	0.004	.0310401	.1585025
L3.	-.072558	.0330595	-2.19	0.028	-.1373533	-.0077626
L4.	.0096243	.0332296	0.29	0.772	-.0555045	.0747532
L5.	-.0205357	.03318	-0.62	0.536	-.0855672	.0444959
L6.	-.0167657	.0327844	-0.51	0.609	-.081022	.0474907
L7.	.0845414	.0337448	2.51	0.012	.0184028	.1506801
L8.	-.0422495	.0329344	-1.28	0.200	-.1067997	.0223007
L9.	-.0107337	.0318195	-0.34	0.736	-.0730987	.0516313
L10.	.0364449	.0317955	1.15	0.252	-.0258731	.0987629
L11.	-.0712487	.0321117	-2.22	0.027	-.1341864	-.008311
L12.	.0939318	.0320575	2.93	0.003	.0311002	.1567633
L13.	-.0496403	.0262514	-1.89	0.059	-.1010921	.0018115
LateProd						
L1.	-.0479102	.0221806	-2.16	0.031	-.0913834	-.0044369
L2.	.0008251	.0238924	0.03	0.972	-.0460032	.0476533
L3.	.0142094	.0248071	0.57	0.567	-.0344117	.0628305
L4.	-.0165181	.024132	-0.68	0.494	-.0638161	.0307798
L5.	.0576599	.0240369	2.40	0.016	.0105484	.1047714
L6.	-.0203875	.0241296	-0.84	0.398	-.0676806	.0269056
L7.	.0000568	.024415	0.00	0.998	-.0477957	.0479093
L8.	-.0394883	.0243784	-1.62	0.105	-.087269	.0082924
L9.	.0085854	.0242644	0.35	0.723	-.0389719	.0561427
L10.	.029397	.0241528	1.22	0.224	-.0179417	.0767356
L11.	-.0419517	.0244759	-1.71	0.087	-.0899236	.0060201
L12.	.0075266	.023881	0.32	0.753	-.0392792	.0543325
L13.	.0039223	.0218698	0.18	0.858	-.0389418	.0467864
TaylorGap						
L1.	.0012215	.0018291	0.67	0.504	-.0023633	.0048064
L2.	-.0022321	.0023699	-0.94	0.346	-.006877	.0024128
L3.	-.0015969	.0023845	-0.67	0.503	-.0062703	.0030765
L4.	.0012439	.002387	0.52	0.602	-.0034345	.0059223
L5.	.0023912	.0023833	1.00	0.316	-.00228	.0070625
L6.	-.0016125	.0023886	-0.68	0.500	-.0062942	.0030691
L7.	.0011626	.0023899	0.49	0.627	-.0035216	.0058468
L8.	.0008822	.0023715	0.37	0.710	-.0037658	.0055302
L9.	-.0002636	.0023631	-0.11	0.911	-.0048952	.0043681

L10.	-.0009286	.0023413	-0.40	0.692	-.0055174	.0036603
L11.	.0003675	.0022997	0.16	0.873	-.0041398	.0048748
L12.	-.0004773	.0022815	-0.21	0.834	-.004949	.0039944
L13.	.0003726	.0017463	0.21	0.831	-.0030501	.0037953
Constant	.0075469	.0226831	0.33	0.739	-.0369112	.052005
LatePPI						
EarlyPPI						
L1.	-.0727762	.0196591	-3.70	0.000	-.1113074	-.034245
L2.	-.0305141	.033381	-0.91	0.361	-.0959397	.0349114
L3.	.0784272	.0343276	2.28	0.022	.0111464	.145708
L4.	.0287195	.0340349	0.84	0.399	-.0379877	.0954267
L5.	-.0297888	.03418	-0.87	0.383	-.0967803	.0372027
L6.	.0519265	.0339659	1.53	0.126	-.0146454	.1184984
L7.	-.0861734	.0338397	-2.55	0.011	-.152498	-.0198487
L8.	.0413446	.0336247	1.23	0.219	-.0245587	.1072479
L9.	-.0466459	.0331286	-1.41	0.159	-.1115768	.018285
L10.	.068419	.033378	2.05	0.040	.0029993	.1338386
L11.	-.0046993	.033789	-0.14	0.889	-.0709245	.061526
L12.	-.0447311	.0328983	-1.36	0.174	-.1092106	.0197483
L13.	.026103	.0210604	1.24	0.215	-.0151746	.0673805
LatePPI						
L1.	1.150888	.0490528	23.46	0.000	1.054747	1.24703
L2.	-.060724	.0746206	-0.81	0.416	-.2069777	.0855298
L3.	.1427868	.0752925	1.90	0.058	-.0047839	.2903574
L4.	-.2379622	.0766653	-3.10	0.002	-.3882234	-.087701
L5.	-.0298354	.0776348	-0.38	0.701	-.1819968	.1223259
L6.	-.0140919	.0776805	-0.18	0.856	-.1663429	.138159
L7.	.0235437	.0781171	0.30	0.763	-.129563	.1766504
L8.	.1324468	.0777977	1.70	0.089	-.0200339	.2849275
L9.	-.1057799	.078818	-1.34	0.180	-.2602604	.0487006
L10.	-.0741875	.0789425	-0.94	0.347	-.228912	.080537
L11.	.0622047	.0788992	0.79	0.430	-.0924348	.2168442
L12.	.1125649	.0781004	1.44	0.150	-.040509	.2656388
L13.	-.1072141	.0514916	-2.08	0.037	-.2081358	-.0062925
EarlyProd						
L1.	-.0110679	.0113632	-0.97	0.330	-.0333394	.0112035
L2.	-.0171499	.0125851	-1.36	0.173	-.0418161	.0075164
L3.	-.0057152	.0127952	-0.45	0.655	-.0307933	.0193629
L4.	.0060755	.012861	0.47	0.637	-.0191317	.0312827
L5.	.022548	.0128418	1.76	0.079	-.0026215	.0477176
L6.	-.0196014	.0126888	-1.54	0.122	-.0444709	.0052681
L7.	.0121132	.0130605	0.93	0.354	-.0134848	.0377113
L8.	-.0224701	.0127468	-1.76	0.078	-.0474533	.0025132
L9.	.0278118	.0123153	2.26	0.024	.0036743	.0519493
L10.	.0006999	.012306	0.06	0.955	-.0234194	.0248192
L11.	-.0073865	.0124284	-0.59	0.552	-.0317457	.0169726
L12.	-.0214338	.0124074	-1.73	0.084	-.0457518	.0028843
L13.	.0212858	.0101602	2.10	0.036	.0013721	.0411995
LateProd						
L1.	-.0011409	.0085847	-0.13	0.894	-.0179666	.0156848
L2.	.0181476	.0092472	1.96	0.050	.0000234	.0362718
L3.	.007372	.0096013	0.77	0.443	-.0114461	.0261901
L4.	.008422	.00934	0.90	0.367	-.009884	.026728
L5.	-.0053231	.0093031	-0.57	0.567	-.0235569	.0129108
L6.	.0105376	.009339	1.13	0.259	-.0077665	.0288418
L7.	-.0220001	.0094495	-2.33	0.020	-.0405208	-.0034795
L8.	.0133339	.0094353	1.41	0.158	-.0051589	.0318268
L9.	-.0209649	.0093912	-2.23	0.026	-.0393713	-.0025585
L10.	.0005831	.009348	0.06	0.950	-.0177386	.0189049

L11.	.0008162	.009473	0.09	0.931	-.0177506	.019383
L12.	.0160168	.0092428	1.73	0.083	-.0020987	.0341324
L13.	-.0104483	.0084644	-1.23	0.217	-.0270383	.0061416
TaylorGap						
L1.	.000102	.0007079	0.14	0.885	-.0012855	.0014895
L2.	.0005627	.0009172	0.61	0.540	-.0012351	.0023604
L3.	.0003456	.0009229	0.37	0.708	-.0014632	.0021543
L4.	-.0015687	.0009238	-1.70	0.090	-.0033794	.000242
L5.	.0004699	.0009224	0.51	0.610	-.001338	.0022779
L6.	-.0016636	.0009245	-1.80	0.072	-.0034756	.0001483
L7.	.0008076	.000925	0.87	0.383	-.0010054	.0026205
L8.	.0005887	.0009178	0.64	0.521	-.0012102	.0023876
L9.	-.000035	.0009146	-0.04	0.969	-.0018276	.0017576
L10.	.0001879	.0009062	0.21	0.836	-.0015881	.001964
L11.	-.0008067	.0008901	-0.91	0.365	-.0025512	.0009378
L12.	.001027	.000883	1.16	0.245	-.0007037	.0027577
L13.	-.000499	.0006759	-0.74	0.460	-.0018238	.0008257
Constant	.0247393	.0087792	2.82	0.005	.0075324	.0419462
EarlyProd						
EarlyPPI						
L1.	-.0298072	.1011141	-0.29	0.768	-.2279872	.1683728
L2.	.1572818	.1716907	0.92	0.360	-.1792258	.4937893
L3.	.0219161	.1765593	0.12	0.901	-.3241337	.3679659
L4.	.180136	.1750541	1.03	0.303	-.1629637	.5232358
L5.	-.300562	.1758001	-1.71	0.087	-.6451238	.0439999
L6.	-.1436765	.1746989	-0.82	0.411	-.4860802	.1987271
L7.	.0075929	.1740502	0.04	0.965	-.3335392	.348725
L8.	.0061179	.1729443	0.04	0.972	-.3328467	.3450825
L9.	-.0016269	.1703926	-0.01	0.992	-.3355903	.3323364
L10.	-.0724496	.1716752	-0.42	0.673	-.4089267	.2640276
L11.	-.0027184	.1737892	-0.02	0.988	-.343339	.3379022
L12.	.1571829	.169208	0.93	0.353	-.1744586	.4888244
L13.	.0110384	.1083211	0.10	0.919	-.2012671	.2233438
LatePPI						
L1.	-.0527426	.2522964	-0.21	0.834	-.5472344	.4417492
L2.	-.5970516	.3838011	-1.56	0.120	-1.349288	.1551846
L3.	.6011368	.387257	1.55	0.121	-.157873	1.360147
L4.	-.3667621	.3943175	-0.93	0.352	-1.13961	.4060861
L5.	.5489362	.3993039	1.37	0.169	-.2336851	1.331557
L6.	.3305706	.3995391	0.83	0.408	-.4525116	1.113653
L7.	-.4816162	.4017847	-1.20	0.231	-1.2691	.3058674
L8.	.3516949	.400142	0.88	0.379	-.4325691	1.135959
L9.	-.3905559	.4053899	-0.96	0.335	-1.185105	.4039936
L10.	-.3100957	.4060302	-0.76	0.445	-1.1059	.4857089
L11.	.3738337	.4058072	0.92	0.357	-.4215339	1.169201
L12.	-.576904	.4016986	-1.44	0.151	-1.364219	.2104108
L13.	.5461088	.2648401	2.06	0.039	.0270318	1.065186
EarlyProd						
L1.	.6168514	.058445	10.55	0.000	.5023014	.7314014
L2.	-.1491273	.0647295	-2.30	0.021	-.2759949	-.0222598
L3.	.2730846	.0658104	4.15	0.000	.1440986	.4020706
L4.	-.0311696	.066149	-0.47	0.637	-.1608193	.0984802
L5.	.0455974	.0660502	0.69	0.490	-.0838587	.1750535
L6.	.12129	.0652629	1.86	0.063	-.0066229	.2492029
L7.	.020507	.0671747	0.31	0.760	-.111153	.152167
L8.	.0408039	.0655614	0.62	0.534	-.087694	.1693018
L9.	-.0340285	.0633419	-0.54	0.591	-.1581764	.0901193
L10.	-.2502105	.0632942	-3.95	0.000	-.3742648	-.1261561
L11.	.0159861	.0639236	0.25	0.803	-.1093018	.1412741

L12.	.5333695	.0638158	8.36	0.000	.4082928	.6584462
L13.	-.3557576	.0522578	-6.81	0.000	-.4581809	-.2533342
LateProd						
L1.	.0839119	.0441542	1.90	0.057	-.0026287	.1704526
L2.	.1866154	.0475618	3.92	0.000	.093396	.2798348
L3.	-.100012	.0493827	-2.03	0.043	-.1968004	-.0032236
L4.	-.0664009	.0480388	-1.38	0.167	-.1605553	.0277534
L5.	-.0837865	.0478495	-1.75	0.080	-.1775698	.0099967
L6.	.2070576	.0480339	4.31	0.000	.1129128	.3012025
L7.	-.1187383	.0486021	-2.44	0.015	-.2139966	-.0234799
L8.	-.1073448	.0485292	-2.21	0.027	-.2024602	-.0122294
L9.	-.0145068	.0483023	-0.30	0.764	-.1091776	.0801639
L10.	.2025514	.0480802	4.21	0.000	.1083159	.2967868
L11.	.0648022	.0487233	1.33	0.184	-.0306936	.1602981
L12.	.0355005	.0475391	0.75	0.455	-.0576743	.1286754
L13.	-.1079006	.0435355	-2.48	0.013	-.1932287	-.0225725
TaylorGap						
L1.	-.0051679	.003641	-1.42	0.156	-.0123042	.0019684
L2.	-.0022314	.0047177	-0.47	0.636	-.0114779	.0070151
L3.	.0083197	.0047466	1.75	0.080	-.0009836	.0176229
L4.	-.001001	.0047517	-0.21	0.833	-.0103142	.0083121
L5.	.0100824	.0047444	2.13	0.034	.0007835	.0193813
L6.	-.0064217	.004755	-1.35	0.177	-.0157413	.0028979
L7.	.0048334	.0047576	1.02	0.310	-.0044913	.0141581
L8.	-.0041545	.0047208	-0.88	0.379	-.0134071	.0050981
L9.	-.0024048	.0047042	-0.51	0.609	-.0116248	.0068152
L10.	-.0058702	.0046607	-1.26	0.208	-.0150051	.0032647
L11.	.0071513	.0045779	1.56	0.118	-.0018212	.0161238
L12.	-.0037601	.0045417	-0.83	0.408	-.0126617	.0051415
L13.	-.0040132	.0034764	-1.15	0.248	-.0108267	.0028003
Constant	-.0023406	.0451546	-0.05	0.959	-.0908419	.0861607
LateProd						
EarlyPPI						
L1.	-.0976857	.1320323	-0.74	0.459	-.3564643	.1610929
L2.	-.0408325	.2241895	-0.18	0.855	-.4802359	.3985708
L3.	.2406775	.2305468	1.04	0.297	-.2111859	.6925409
L4.	.1600342	.2285814	0.70	0.484	-.2879771	.6080455
L5.	-.3410668	.2295555	-1.49	0.137	-.7909872	.1088537
L6.	.0194117	.2281176	0.09	0.932	-.4276906	.466514
L7.	-.0215609	.2272705	-0.09	0.924	-.4670029	.4238811
L8.	-.063053	.2258265	-0.28	0.780	-.5056647	.3795588
L9.	.2346743	.2224945	1.05	0.292	-.201407	.6707555
L10.	-.1383572	.2241693	-0.62	0.537	-.5777209	.3010064
L11.	-.3002492	.2269297	-1.32	0.186	-.7450232	.1445249
L12.	.2959424	.2209476	1.34	0.180	-.137107	.7289918
L13.	.0274607	.141443	0.19	0.846	-.2497626	.3046839
LatePPI						
L1.	.0888353	.3294424	0.27	0.787	-.5568601	.7345306
L2.	.1949363	.5011581	0.39	0.697	-.7873155	1.177188
L3.	-.9756842	.5056707	-1.93	0.054	-1.966781	.0154123
L4.	.5900855	.5148902	1.15	0.252	-.4190808	1.599252
L5.	-.0890395	.5214013	-0.17	0.864	-1.110967	.9328883
L6.	1.161671	.5217084	2.23	0.026	.1391415	2.184201
L7.	-1.339536	.5246407	-2.55	0.011	-2.367813	-.3112588
L8.	.7834803	.5224957	1.50	0.134	-.2405925	1.807553
L9.	-.3600322	.5293482	-0.68	0.496	-1.397536	.6774712
L10.	-.7128818	.5301844	-1.34	0.179	-1.752024	.3262605
L11.	.8626248	.5298932	1.63	0.104	-.1759468	1.901196
L12.	-.9601822	.5245283	-1.83	0.067	-1.988239	.0678744

L13.	.7262094	.3458217	2.10	0.036	.0484113	1.404007
EarlyProd						
L1.	-.0371823	.076316	-0.49	0.626	-.1867589	.1123943
L2.	-.2612504	.0845222	-3.09	0.002	-.4269109	-.0955899
L3.	.1319197	.0859336	1.54	0.125	-.0365071	.3003464
L4.	-.075599	.0863758	-0.88	0.381	-.2448925	.0936945
L5.	-.0948657	.0862468	-1.10	0.271	-.2639064	.0741749
L6.	.3902715	.0852187	4.58	0.000	.2232459	.557297
L7.	-.1151321	.0877151	-1.31	0.189	-.2870505	.0567863
L8.	.0397285	.0856084	0.46	0.643	-.1280609	.207518
L9.	-.0531518	.0827103	-0.64	0.520	-.215261	.1089575
L10.	.0388511	.082648	0.47	0.638	-.123136	.2008382
L11.	-.1124518	.0834698	-1.35	0.178	-.2760497	.051146
L12.	.0929557	.0833291	1.12	0.265	-.0703664	.2562778
L13.	.0349773	.0682369	0.51	0.608	-.0987646	.1687193
LateProd						
L1.	.6331092	.0576555	10.98	0.000	.5201064	.7461119
L2.	.373421	.062105	6.01	0.000	.2516974	.4951446
L3.	-.0611413	.0644828	-0.95	0.343	-.1875253	.0652426
L4.	-.110495	.0627279	-1.76	0.078	-.2334394	.0124494
L5.	.0882343	.0624807	1.41	0.158	-.0342256	.2106941
L6.	.0429047	.0627216	0.68	0.494	-.0800273	.1658367
L7.	-.0379867	.0634634	-0.60	0.549	-.1623727	.0863993
L8.	-.1113518	.0633682	-1.76	0.079	-.2355512	.0128475
L9.	-.0911137	.063072	-1.44	0.149	-.2147325	.0325051
L10.	.1321329	.062782	2.10	0.035	.0090825	.2551833
L11.	.1788726	.0636217	2.81	0.005	.0541764	.3035687
L12.	.465873	.0620753	7.50	0.000	.3442076	.5875385
L13.	-.5231769	.0568476	-9.20	0.000	-.6345962	-.4117575
TaylorGap						
L1.	-.0037816	.0047544	-0.80	0.426	-.0131	.0055369
L2.	.0101966	.0061602	1.66	0.098	-.0018772	.0222705
L3.	.0008163	.0061981	0.13	0.895	-.0113317	.0129643
L4.	-.0034363	.0062046	-0.55	0.580	-.0155972	.0087246
L5.	.013165	.0061951	2.13	0.034	.0010228	.0253073
L6.	-.0099524	.0062089	-1.60	0.109	-.0221218	.0022169
L7.	-.0025863	.0062123	-0.42	0.677	-.0147622	.0095897
L8.	.0011828	.0061643	0.19	0.848	-.010899	.0132646
L9.	.0077582	.0061426	1.26	0.207	-.0042811	.0197975
L10.	-.0074657	.0060859	-1.23	0.220	-.0193938	.0044625
L11.	.0022075	.0059777	0.37	0.712	-.0095085	.0139236
L12.	-.0057163	.0059305	-0.96	0.335	-.0173398	.0059072
L13.	-.0037334	.0045393	-0.82	0.411	-.0126304	.0051635
Constant	.0998163	.0589617	1.69	0.090	-.0157466	.2153791
TaylorGap						
EarlyPPI						
L1.	-.9068893	1.382337	-0.66	0.512	-3.61622	1.802442
L2.	.5474749	2.347193	0.23	0.816	-4.05294	5.147889
L3.	-3.33344	2.413752	-1.38	0.167	-8.064307	1.397428
L4.	3.214773	2.393175	1.34	0.179	-1.475764	7.90531
L5.	.0943194	2.403373	0.04	0.969	-4.616206	4.804845
L6.	-2.235741	2.388319	-0.94	0.349	-6.916761	2.44528
L7.	1.624512	2.37945	0.68	0.495	-3.039125	6.288149
L8.	.5458331	2.364332	0.23	0.817	-4.088172	5.179838
L9.	-1.482062	2.329447	-0.64	0.525	-6.047695	3.083571
L10.	4.934007	2.346981	2.10	0.036	.3340084	9.534006
L11.	-3.484466	2.375882	-1.47	0.142	-8.14111	1.172178
L12.	.8629992	2.313252	0.37	0.709	-3.670891	5.39689
L13.	-1.059986	1.480864	-0.72	0.474	-3.962426	1.842454

LatePPI						
L1.	4.000951	3.449159	1.16	0.246	-2.759276	10.76118
L2.	-6.217778	5.246967	-1.19	0.236	-16.50164	4.066088
L3.	9.746198	5.294213	1.84	0.066	-.6302689	20.12267
L4.	-6.486152	5.390738	-1.20	0.229	-17.0518	4.0795
L5.	-4.396179	5.458907	-0.81	0.421	-15.09544	6.303083
L6.	5.503691	5.462123	1.01	0.314	-5.201873	16.20925
L7.	-3.867017	5.492823	-0.70	0.481	-14.63275	6.898718
L8.	6.588783	5.470365	1.20	0.228	-4.132936	17.3105
L9.	-.4356638	5.542109	-0.08	0.937	-11.298	10.42667
L10.	-14.97696	5.550863	-2.70	0.007	-25.85645	-4.097472
L11.	5.214916	5.547815	0.94	0.347	-5.658601	16.08843
L12.	2.880608	5.491646	0.52	0.600	-7.88282	13.64404
L13.	2.262525	3.620644	0.62	0.532	-4.833807	9.358857
EarlyProd						
L1.	-1.596756	.7990044	-2.00	0.046	-3.162776	-.0307362
L2.	1.019254	.8849212	1.15	0.249	-.7151599	2.753667
L3.	-.1361248	.8996977	-0.15	0.880	-1.8995	1.62725
L4.	.0077631	.9043275	0.01	0.993	-1.764686	1.780212
L5.	.809371	.9029768	0.90	0.370	-.9604311	2.579173
L6.	-1.664297	.8922127	-1.87	0.062	-3.413002	.0844081
L7.	.8953594	.9183494	0.97	0.330	-.9045723	2.695291
L8.	-.7255259	.8962931	-0.81	0.418	-2.482228	1.031176
L9.	1.174906	.865951	1.36	0.175	-.5223264	2.872139
L10.	-1.441739	.8652986	-1.67	0.096	-3.137693	.2542155
L11.	.265159	.8739029	0.30	0.762	-1.447659	1.977977
L12.	.0103608	.8724298	0.01	0.991	-1.69957	1.720292
L13.	.0859207	.7144191	0.12	0.904	-1.314315	1.486156
LateProd						
L1.	1.636623	.603635	2.71	0.007	.4535199	2.819726
L2.	-1.124936	.65022	-1.73	0.084	-2.399344	.149472
L3.	.6977583	.6751144	1.03	0.301	-.6254417	2.020958
L4.	.3686055	.6567414	0.56	0.575	-.918584	1.655795
L5.	-1.203749	.654153	-1.84	0.066	-2.485866	.0783669
L6.	.1876205	.656675	0.29	0.775	-1.099439	1.47468
L7.	.5323759	.6644421	0.80	0.423	-.7699068	1.834659
L8.	.5812993	.6634449	0.88	0.381	-.7190289	1.881627
L9.	-.987649	.6603435	-1.50	0.135	-2.281898	.3066005
L10.	1.153774	.6573074	1.76	0.079	-.1345251	2.442073
L11.	.092709	.6660988	0.14	0.889	-1.212821	1.398239
L12.	.697203	.6499092	1.07	0.283	-.5765957	1.971002
L13.	-1.096026	.595177	-1.84	0.066	-2.262551	.0704994
TaylorGap						
L1.	.8556145	.0497769	17.19	0.000	.7580537	.9531753
L2.	-.0009993	.0644958	-0.02	0.988	-.1274087	.1254101
L3.	.1748613	.0648917	2.69	0.007	.047676	.3020466
L4.	-.0516904	.0649607	-0.80	0.426	-.1790111	.0756302
L5.	.0504734	.0648612	0.78	0.436	-.0766522	.1775989
L6.	-.0376545	.0650057	-0.58	0.562	-.1650634	.0897543
L7.	-.0315692	.0650413	-0.49	0.627	-.1590478	.0959094
L8.	-.0093708	.0645382	-0.15	0.885	-.1358634	.1171218
L9.	.0061132	.0643113	0.10	0.924	-.1199346	.1321609
L10.	-.0007587	.0637172	-0.01	0.991	-.1256422	.1241248
L11.	-.0171725	.0625846	-0.27	0.784	-.139836	.105491
L12.	-.2118862	.0620902	-3.41	0.001	-.3335808	-.0901916
L13.	.1977529	.0475254	4.16	0.000	.1046049	.290901
Constant	.5507059	.6173106	0.89	0.372	-.6592007	1.760613

Appendix 5
VAR with LNMonetaryBase

Sample: 1984m3 - 2017m12		Number of obs	= 406
Log likelihood =	6337.015	AIC	= -29.59121
FPE =	9.83e-20	HQIC	= -28.30239
Det(Sigma_ml) =	1.91e-20	SBIC	= -26.33481

Equation	Parameters	RMSE	R-square	chi2	P>chi2
EarlyPPI	66	.009743	0.9610	9995.665	0.0000
LatePPI	66	.003792	0.9993	611054	0.0000
EarlyProd	66	.019541	0.9886	35215.54	0.0000
LateProd	66	.026125	0.9617	10186.23	0.0000
LNMonetaryBase	66	.015431	0.9997	1174981	0.0000

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
EarlyPPI						
EarlyPPI						
L1.	1.385392	.0499115	27.76	0.000	1.287567	1.483217
L2.	-.5670197	.0853172	-6.65	0.000	-.7342382	-.3998011
L3.	.124524	.0881062	1.41	0.158	-.0481609	.297209
L4.	.0428177	.0875615	0.49	0.625	-.1287998	.2144352
L5.	-.1339131	.0877096	-1.53	0.127	-.3058207	.0379944
L6.	-.00299	.0872803	-0.03	0.973	-.1740562	.1680762
L7.	.1056753	.0866658	1.22	0.223	-.0641866	.2755371
L8.	-.0337405	.0862569	-0.39	0.696	-.202801	.1353199
L9.	-.0072996	.0854993	-0.09	0.932	-.1748751	.1602759
L10.	.1346506	.0857385	1.57	0.116	-.0333937	.3026949
L11.	-.2011793	.0861474	-2.34	0.020	-.3700251	-.0323335
L12.	.20088	.0843285	2.38	0.017	.0355992	.3661608
L13.	-.098736	.0545554	-1.81	0.070	-.2056626	.0081906
LatePPI						
L1.	.0105568	.1274021	0.08	0.934	-.2391467	.2602604
L2.	.0503578	.1924488	0.26	0.794	-.326835	.4275506
L3.	.0784961	.1924913	0.41	0.683	-.29878	.4557722
L4.	.1275732	.1953947	0.65	0.514	-.2553934	.5105399
L5.	-.4893102	.1977678	-2.47	0.013	-.876928	-.1016923
L6.	.6700577	.1963464	3.41	0.001	.2852258	1.05489
L7.	-.2468613	.1976055	-1.25	0.212	-.6341609	.1404382
L8.	-.4702624	.1981845	-2.37	0.018	-.858697	-.0818279
L9.	.4336015	.2014607	2.15	0.031	.0387458	.8284573
L10.	-.161165	.202863	-0.79	0.427	-.5587692	.2364392
L11.	-.0851658	.2021803	-0.42	0.674	-.4814319	.3111003
L12.	.0577094	.2004086	0.29	0.773	-.3350842	.450503
L13.	.0454474	.131058	0.35	0.729	-.2114215	.3023163
EarlyProd						
L1.	.0180316	.0295259	0.61	0.541	-.0398381	.0759012
L2.	.104428	.0327252	3.19	0.001	.0402879	.1685681
L3.	-.0871556	.0327798	-2.66	0.008	-.1514029	-.0229084
L4.	.0124868	.0326652	0.38	0.702	-.0515359	.0765095
L5.	-.0265711	.0323268	-0.82	0.411	-.0899304	.0367882
L6.	-.0193564	.0323923	-0.60	0.550	-.0828441	.0441314
L7.	.0760001	.0332531	2.29	0.022	.0108252	.1411751
L8.	-.0398759	.032191	-1.24	0.215	-.1029691	.0232173
L9.	-.0071513	.0315262	-0.23	0.821	-.0689415	.0546388
L10.	.0291979	.0314813	0.93	0.354	-.0325042	.0909001
L11.	-.0734539	.0319548	-2.30	0.022	-.1360841	-.0108236
L12.	.0938443	.0316505	2.97	0.003	.0318105	.1558781

L13.	-.0578034	.0260055	-2.22	0.026	-.1087733	-.0068335
LateProd						
L1.	-.0541661	.0219569	-2.47	0.014	-.0972008	-.0111313
L2.	-.0041799	.0241986	-0.17	0.863	-.0516083	.0432485
L3.	.0222405	.0247678	0.90	0.369	-.0263035	.0707845
L4.	-.0097547	.0238637	-0.41	0.683	-.0565268	.0370173
L5.	.0618867	.0237445	2.61	0.009	.0153484	.108425
L6.	-.0218434	.0238623	-0.92	0.360	-.0686126	.0249258
L7.	.0129257	.0243319	0.53	0.595	-.034764	.0606154
L8.	-.0443021	.024294	-1.82	0.068	-.0919176	.0033133
L9.	.0103183	.0243498	0.42	0.672	-.0374064	.058043
L10.	.0301358	.0242298	1.24	0.214	-.0173536	.0776253
L11.	-.0425029	.0244768	-1.74	0.082	-.0904765	.0054707
L12.	.0119052	.023956	0.50	0.619	-.0350477	.0588582
L13.	.0176876	.0214128	0.83	0.409	-.0242807	.059656
LNMonetaryBase						
L1.	-.0148106	.0323534	-0.46	0.647	-.0782221	.0486009
L2.	-.0291953	.0498849	-0.59	0.558	-.126968	.0685774
L3.	.0652953	.0495427	1.32	0.188	-.0318067	.1623973
L4.	.0055855	.0490875	0.11	0.909	-.0906242	.1017951
L5.	-.0222678	.0489727	-0.45	0.649	-.1182525	.073717
L6.	-.0429199	.0488861	-0.88	0.380	-.1387349	.0528951
L7.	.0765091	.0486608	1.57	0.116	-.0188643	.1718825
L8.	-.0847152	.0486827	-1.74	0.082	-.1801316	.0107011
L9.	.0361313	.0489437	0.74	0.460	-.0597965	.1320591
L10.	.0079737	.0488065	0.16	0.870	-.0876853	.1036327
L11.	-.0256432	.0482343	-0.53	0.595	-.1201807	.0688944
L12.	.0371268	.0481078	0.77	0.440	-.0571629	.1314164
L13.	-.0065326	.032284	-0.20	0.840	-.069808	.0567428
Constant	-.0154828	.0332041	-0.47	0.641	-.0805617	.0495961
LatePPI						
EarlyPPI						
L1.	-.0764899	.0194231	-3.94	0.000	-.1145586	-.0384213
L2.	-.0333732	.0332013	-1.01	0.315	-.0984465	.0317002
L3.	.0855794	.0342867	2.50	0.013	.0183788	.15278
L4.	.0321875	.0340747	0.94	0.345	-.0345977	.0989727
L5.	-.0260457	.0341323	-0.76	0.445	-.0929438	.0408523
L6.	.0451253	.0339653	1.33	0.184	-.0214454	.1116959
L7.	-.0814513	.0337261	-2.42	0.016	-.1475533	-.0153493
L8.	.0310916	.033567	0.93	0.354	-.0346985	.0968818
L9.	-.0337573	.0332722	-1.01	0.310	-.0989695	.031455
L10.	.0718987	.0333653	2.15	0.031	.006504	.1372934
L11.	-.0048331	.0335244	-0.14	0.885	-.0705397	.0608736
L12.	-.0524299	.0328166	-1.60	0.110	-.1167492	.0118894
L13.	.0305143	.0212303	1.44	0.151	-.0110964	.0721249
LatePPI						
L1.	1.153912	.0495787	23.27	0.000	1.056739	1.251084
L2.	-.0613013	.0748918	-0.82	0.413	-.2080865	.0854838
L3.	.1496277	.0749083	2.00	0.046	.0028102	.2964453
L4.	-.2432682	.0760382	-3.20	0.001	-.3923002	-.0942361
L5.	-.0449031	.0769616	-0.58	0.560	-.1957451	.105939
L6.	-.0052795	.0764085	-0.07	0.945	-.1550375	.1444784
L7.	.0133119	.0768985	0.17	0.863	-.1374063	.1640301
L8.	.1554546	.0771238	2.02	0.044	.0042947	.3066144
L9.	-.1103603	.0783987	-1.41	0.159	-.264019	.0432984
L10.	-.093166	.0789444	-1.18	0.238	-.2478942	.0615623
L11.	.0553553	.0786788	0.70	0.482	-.0988523	.2095628
L12.	.0877743	.0779893	1.13	0.260	-.0650819	.2406305
L13.	-.0655527	.0510014	-1.29	0.199	-.1655136	.0344082

EarlyProd						
L1.	-.0134843	.01149	-1.17	0.241	-.0360044	.0090357
L2.	-.0182284	.012735	-1.43	0.152	-.0431887	.0067318
L3.	-.0065819	.0127563	-0.52	0.606	-.0315838	.01842
L4.	.0072651	.0127117	0.57	0.568	-.0176494	.0321796
L5.	.0230923	.01258	1.84	0.066	-.0015641	.0477487
L6.	-.0221215	.0126055	-1.75	0.079	-.0468279	.0025848
L7.	.0128372	.0129405	0.99	0.321	-.0125258	.0382001
L8.	-.0241711	.0125272	-1.93	0.054	-.0487239	.0003817
L9.	.0272544	.0122685	2.22	0.026	.0032087	.0513001
L10.	.0034227	.012251	0.28	0.780	-.0205888	.0274342
L11.	-.0118315	.0124353	-0.95	0.341	-.0362041	.0125412
L12.	-.0188426	.0123168	-1.53	0.126	-.0429831	.005298
L13.	.017827	.0101201	1.76	0.078	-.002008	.037662
LateProd						
L1.	-.0028473	.0085446	-0.33	0.739	-.0195943	.0138998
L2.	.0181981	.0094169	1.93	0.053	-.0002587	.036655
L3.	.0092398	.0096384	0.96	0.338	-.0096511	.0281308
L4.	.0061623	.0092866	0.66	0.507	-.0120391	.0243638
L5.	-.0047927	.0092402	-0.52	0.604	-.0229032	.0133177
L6.	.0126148	.009286	1.36	0.174	-.0055855	.0308151
L7.	-.0238474	.0094688	-2.52	0.012	-.0424059	-.0052889
L8.	.014904	.0094541	1.58	0.115	-.0036257	.0334336
L9.	-.0220268	.0094758	-2.32	0.020	-.040599	-.0034547
L10.	.0004749	.009429	0.05	0.960	-.0180056	.0189555
L11.	.0030012	.0095252	0.32	0.753	-.0156678	.0216702
L12.	.0133867	.0093225	1.44	0.151	-.0048851	.0316585
L13.	-.0068171	.0083328	-0.82	0.413	-.0231492	.0095149
LNMonetaryBase						
L1.	-.0065606	.0125904	-0.52	0.602	-.0312373	.0181161
L2.	-.0076063	.0194128	-0.39	0.695	-.0456547	.0304421
L3.	.0109167	.0192796	0.57	0.571	-.0268706	.0487041
L4.	-.0010983	.0191025	-0.06	0.954	-.0385385	.0363418
L5.	.0265443	.0190578	1.39	0.164	-.0108083	.063897
L6.	-.0193828	.0190241	-1.02	0.308	-.0566693	.0179038
L7.	.0017621	.0189364	0.09	0.926	-.0353526	.0388768
L8.	-.0226205	.0189449	-1.19	0.232	-.0597519	.014511
L9.	.0202425	.0190465	1.06	0.288	-.017088	.0575729
L10.	-.0068327	.0189931	-0.36	0.719	-.0440586	.0303931
L11.	.0314252	.0187705	1.67	0.094	-.0053642	.0682146
L12.	-.0374161	.0187212	-2.00	0.046	-.074109	-.0007231
L13.	.0121576	.0125634	0.97	0.333	-.0124661	.0367813
Constant	.0045929	.0129214	0.36	0.722	-.0207327	.0299184
EarlyProd						
EarlyPPI						
L1.	-.0395641	.100102	-0.40	0.693	-.2357604	.1566322
L2.	.113648	.1711112	0.66	0.507	-.2217238	.4490198
L3.	.07289	.1767049	0.41	0.680	-.2734452	.4192251
L4.	.1849703	.1756125	1.05	0.292	-.1592239	.5291645
L5.	-.3325673	.1759093	-1.89	0.059	-.6773433	.0122087
L6.	-.0922841	.1750484	-0.53	0.598	-.4353726	.2508044
L7.	.0025772	.173816	0.01	0.988	-.338096	.3432503
L8.	-.1013179	.172996	-0.59	0.558	-.4403837	.2377479
L9.	.1108704	.1714764	0.65	0.518	-.2252172	.446958
L10.	-.0756235	.1719562	-0.44	0.660	-.4126514	.2614044
L11.	-.0978461	.1727763	-0.57	0.571	-.4364814	.2407893
L12.	.2951182	.1691283	1.74	0.081	-.0363672	.6266037
L13.	.0199381	.1094157	0.18	0.855	-.1945128	.234389

LatePPI						
L1.	-.1715824	.2555163	-0.67	0.502	-.6723851	.3292204
L2.	-.4271181	.3859733	-1.11	0.268	-1.183612	.3293758
L3.	.5500381	.3860586	1.42	0.154	-.2066228	1.306699
L4.	-.2780318	.3918816	-0.71	0.478	-1.046106	.490042
L5.	.4327163	.396641	1.09	0.275	-.3446858	1.210118
L6.	.4343441	.3937903	1.10	0.270	-.3374706	1.206159
L7.	-.7278071	.3963154	-1.84	0.066	-1.504571	.0489568
L8.	.5913888	.3974768	1.49	0.137	-.1876513	1.370429
L9.	-.3655088	.4040475	-0.90	0.366	-1.157427	.4264097
L10.	-.4325659	.4068599	-1.06	0.288	-1.229997	.3648649
L11.	.5324649	.4054906	1.31	0.189	-.2622822	1.327212
L12.	-.6607369	.4019373	-1.64	0.100	-1.44852	.1270458
L13.	.4889451	.2628485	1.86	0.063	-.0262284	1.004119
EarlyProd						
L1.	.6095154	.0592168	10.29	0.000	.4934526	.7255781
L2.	-.1159159	.0656332	-1.77	0.077	-.2445547	.0127228
L3.	.2363179	.0657429	3.59	0.000	.1074643	.3651715
L4.	.0011207	.065513	0.02	0.986	-.1272825	.129524
L5.	.0303376	.0648342	0.47	0.640	-.0967352	.1574103
L6.	.097416	.0649656	1.50	0.134	-.0299143	.2247463
L7.	.014999	.0666922	0.22	0.822	-.1157152	.1457132
L8.	.0544057	.0645619	0.84	0.399	-.0721334	.1809448
L9.	-.0753496	.0632285	-1.19	0.233	-.1992752	.048576
L10.	-.2513215	.0631385	-3.98	0.000	-.3750707	-.1275724
L11.	.0215372	.0640882	0.34	0.737	-.1040734	.1471477
L12.	.518796	.0634779	8.17	0.000	.3943817	.6432103
L13.	-.3459057	.0521564	-6.63	0.000	-.4481303	-.243681
LateProd						
L1.	.1275779	.0440365	2.90	0.004	.0412679	.213888
L2.	.1604188	.0485325	3.31	0.001	.065297	.2555407
L3.	-.0649233	.049674	-1.31	0.191	-.1622826	.032436
L4.	-.0766448	.0478609	-1.60	0.109	-.1704504	.0171608
L5.	-.0959849	.0476216	-2.02	0.044	-.1893216	-.0026482
L6.	.2475836	.0478579	5.17	0.000	.1537839	.3413834
L7.	-.1157731	.0487999	-2.37	0.018	-.211419	-.0201271
L8.	-.1532312	.0487238	-3.14	0.002	-.2487281	-.0577342
L9.	.0222078	.0488357	0.45	0.649	-.0735083	.117924
L10.	.1785871	.0485949	3.68	0.000	.0833428	.2738315
L11.	.054029	.0490904	1.10	0.271	-.0421864	.1502444
L12.	.0507729	.0480459	1.06	0.291	-.0433954	.1449412
L13.	-.1570946	.0429453	-3.66	0.000	-.2412659	-.0729233
LNMonetaryBase						
L1.	-.0301586	.0648876	-0.46	0.642	-.1573361	.0970188
L2.	-.0700693	.1000487	-0.70	0.484	-.2661612	.1260226
L3.	.1430677	.0993624	1.44	0.150	-.051679	.3378144
L4.	.0142933	.0984493	0.15	0.885	-.1786638	.2072503
L5.	-.087131	.0982192	-0.89	0.375	-.279637	.1053751
L6.	.1781334	.0980454	1.82	0.069	-.0140321	.3702989
L7.	-.0973339	.0975936	-1.00	0.319	-.2886138	.093946
L8.	-.2322336	.0976375	-2.38	0.017	-.4235996	-.0408676
L9.	.2127835	.0981609	2.17	0.030	.0203917	.4051752
L10.	-.1528638	.0978858	-1.56	0.118	-.3447165	.0389889
L11.	.151681	.0967383	1.57	0.117	-.0379225	.3412845
L12.	.0349823	.0964846	0.36	0.717	-.1541239	.2240886
L13.	-.0507461	.0647484	-0.78	0.433	-.1776506	.0761584
Constant	-.2112625	.0665938	-3.17	0.002	-.341784	-.0807409
LateProd						
EarlyPPI						

L1.	-.0806874	.1338303	-0.60	0.547	-.34299	.1816152
L2.	-.1681678	.2287653	-0.74	0.462	-.6165396	.2802041
L3.	.3107545	.2362437	1.32	0.188	-.1522746	.7737837
L4.	.2108413	.2347833	0.90	0.369	-.2493255	.671008
L5.	-.5350924	.2351801	-2.28	0.023	-.996037	-.0741477
L6.	.1308958	.2340291	0.56	0.576	-.3277928	.5895844
L7.	.0648216	.2323815	0.28	0.780	-.3906378	.5202809
L8.	-.2473336	.2312851	-1.07	0.285	-.7006441	.2059769
L9.	.2868976	.2292536	1.25	0.211	-.1624312	.7362263
L10.	-.0312156	.229895	-0.14	0.892	-.4818015	.4193703
L11.	-.4428649	.2309915	-1.92	0.055	-.8955999	.0098701
L12.	.4917455	.2261143	2.17	0.030	.0485696	.9349214
L13.	.0105136	.1462822	0.07	0.943	-.2761942	.2972215
LatePPI						
L1.	.047884	.3416098	0.14	0.889	-.621659	.717427
L2.	.2247342	.516023	0.44	0.663	-.7866523	1.236121
L3.	-.9875862	.5161369	-1.91	0.056	-1.999196	.0240236
L4.	.6469402	.5239219	1.23	0.217	-.3799279	1.673808
L5.	.0411254	.530285	0.08	0.938	-.9982142	1.080465
L6.	1.326311	.5264737	2.52	0.012	.2944413	2.35818
L7.	-1.735755	.5298497	-3.28	0.001	-2.774241	-.6972685
L8.	1.023406	.5314023	1.93	0.054	-.0181236	2.064935
L9.	-.3401868	.540187	-0.63	0.529	-1.398934	.7185602
L10.	-.8212055	.543947	-1.51	0.131	-1.887322	.2449111
L11.	1.030606	.5421164	1.90	0.057	-.0319223	2.093135
L12.	-1.074059	.5373658	-2.00	0.046	-2.127277	-.0208415
L13.	.6006953	.3514125	1.71	0.087	-.0880605	1.289451
EarlyProd						
L1.	-.0550616	.0791692	-0.70	0.487	-.2102304	.1001073
L2.	-.2165505	.0877476	-2.47	0.014	-.3885327	-.0445683
L3.	.088395	.0878942	1.01	0.315	-.0838745	.2606645
L4.	-.0167689	.087587	-0.19	0.848	-.1884362	.1548984
L5.	-.0705513	.0866794	-0.81	0.416	-.2404399	.0993372
L6.	.3653447	.0868551	4.21	0.000	.1951118	.5355776
L7.	-.1124797	.0891634	-1.26	0.207	-.2872366	.0622773
L8.	.0223673	.0863154	0.26	0.796	-.1468078	.1915423
L9.	-.0870586	.0845327	-1.03	0.303	-.2527396	.0786225
L10.	.0285547	.0844123	0.34	0.735	-.1368903	.1939998
L11.	-.0781011	.085682	-0.91	0.362	-.2460348	.0898326
L12.	.0797519	.0848661	0.94	0.347	-.0865825	.2460863
L13.	.0521793	.0697299	0.75	0.454	-.0844888	.1888474
LateProd						
L1.	.7057012	.0588742	11.99	0.000	.59031	.8210925
L2.	.3577633	.064885	5.51	0.000	.2305912	.4849355
L3.	-.0233922	.0664112	-0.35	0.725	-.1535557	.1067713
L4.	-.1401031	.0639871	-2.19	0.029	-.2655155	-.0146907
L5.	.0589959	.0636672	0.93	0.354	-.0657897	.1837814
L6.	.080608	.0639831	1.26	0.208	-.0447966	.2060126
L7.	-.0335683	.0652425	-0.51	0.607	-.1614412	.0943046
L8.	-.1602281	.0651408	-2.46	0.014	-.2879018	-.0325545
L9.	-.0434973	.0652903	-0.67	0.505	-.171464	.0844694
L10.	.1268896	.0649685	1.95	0.051	-.0004463	.2542255
L11.	.1277004	.0656309	1.95	0.052	-.0009338	.2563345
L12.	.4882048	.0642345	7.60	0.000	.3623075	.6141021
L13.	-.5951491	.0574153	-10.37	0.000	-.707681	-.4826171
LNMonetaryBase						
L1.	-.0234459	.0867508	-0.27	0.787	-.1934744	.1465827
L2.	.0726667	.1337591	0.54	0.587	-.1894963	.3348297
L3.	-.0450228	.1328415	-0.34	0.735	-.3053874	.2153417

L4.	.1036127	.1316207	0.79	0.431	-.1543592	.3615846
L5.	-.2903621	.1313131	-2.21	0.027	-.547731	-.0329931
L6.	.3125977	.1310808	2.38	0.017	.0556841	.5695113
L7.	-.0651287	.1304767	-0.50	0.618	-.3208583	.190601
L8.	-.1864055	.1305354	-1.43	0.153	-.4422503	.0694392
L9.	.1225191	.1312351	0.93	0.351	-.134697	.3797352
L10.	-.0967682	.1308674	-0.74	0.460	-.3532636	.1597271
L11.	.0285509	.1293332	0.22	0.825	-.2249374	.2820393
L12.	.1396082	.128994	1.08	0.279	-.1132155	.3924318
L13.	-.0685412	.0865646	-0.79	0.428	-.2382048	.1011224
Constant	.0160323	.0890319	0.18	0.857	-.158467	.1905317
LNMonetaryBase						
EarlyPPI						
L1.	-.0118161	.0790468	-0.15	0.881	-.166745	.1431129
L2.	.1221618	.1351202	0.90	0.366	-.1426689	.3869924
L3.	-.1961446	.1395373	-1.41	0.160	-.4696326	.0773435
L4.	.2247281	.1386747	1.62	0.105	-.0470692	.4965255
L5.	-.1160448	.1389091	-0.84	0.403	-.3883016	.156212
L6.	-.041979	.1382292	-0.30	0.761	-.3129032	.2289453
L7.	.2285009	.1372561	1.66	0.096	-.040516	.4975178
L8.	-.189422	.1366085	-1.39	0.166	-.4571697	.0783257
L9.	-.1208866	.1354085	-0.89	0.372	-.3862825	.1445092
L10.	.1511159	.1357874	1.11	0.266	-.1150225	.4172543
L11.	.1176042	.136435	0.86	0.389	-.1498036	.3850119
L12.	-.0443199	.1335543	-0.33	0.740	-.3060816	.2174418
L13.	-.1047407	.0864015	-1.21	0.225	-.2740846	.0646032
LatePPI						
L1.	.13296	.2017717	0.66	0.510	-.2625054	.5284253
L2.	-.0920629	.3047888	-0.30	0.763	-.689438	.5053121
L3.	-.059991	.3048561	-0.20	0.844	-.657498	.537516
L4.	.0996651	.3094543	0.32	0.747	-.5068542	.7061845
L5.	.0998948	.3132127	0.32	0.750	-.5139908	.7137804
L6.	-.3123706	.3109615	-1.00	0.315	-.9218441	.2971028
L7.	.142356	.3129555	0.45	0.649	-.4710256	.7557376
L8.	-.2373657	.3138726	-0.76	0.450	-.8525447	.3778134
L9.	.5450783	.3190613	1.71	0.088	-.0802703	1.170427
L10.	-.3277106	.3212821	-1.02	0.308	-.957412	.3019908
L11.	-.0744701	.3202009	-0.23	0.816	-.7020523	.5531121
L12.	.1197505	.317395	0.38	0.706	-.5023322	.7418331
L13.	-.0445344	.2075617	-0.21	0.830	-.4513478	.3622789
EarlyProd						
L1.	-.0373032	.0467613	-0.80	0.425	-.1289536	.0543473
L2.	-.0145672	.0518281	-0.28	0.779	-.1161484	.0870141
L3.	.0636688	.0519147	1.23	0.220	-.0380822	.1654197
L4.	-.0139901	.0517332	-0.27	0.787	-.1153853	.0874052
L5.	-.0407203	.0511972	-0.80	0.426	-.1410649	.0596243
L6.	.0275171	.051301	0.54	0.592	-.0730309	.1280652
L7.	-.0567485	.0526643	-1.08	0.281	-.1599687	.0464716
L8.	.021123	.0509822	0.41	0.679	-.0788002	.1210462
L9.	.007294	.0499292	0.15	0.884	-.0905655	.1051534
L10.	.0229843	.0498581	0.46	0.645	-.0747357	.1207044
L11.	-.0112135	.0506081	-0.22	0.825	-.1104035	.0879764
L12.	.0225229	.0501261	0.45	0.653	-.0757225	.1207683
L13.	-.0034888	.041186	-0.08	0.932	-.0842118	.0772342
LateProd						
L1.	-.0007872	.034774	-0.02	0.982	-.068943	.0673686
L2.	.0486765	.0383243	1.27	0.204	-.0264377	.1237907
L3.	-.0734763	.0392257	-1.87	0.061	-.1503573	.0034048
L4.	.023301	.037794	0.62	0.538	-.0507738	.0973758

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
L5.	.0239917	.037605	0.64	0.523	-.0497128	.0976962
L6.	.0171504	.0377916	0.45	0.650	-.0569198	.0912206
L7.	.0213687	.0385354	0.55	0.579	-.0541594	.0968968
L8.	-.0135008	.0384754	-0.35	0.726	-.0889112	.0619096
L9.	-.0078079	.0385637	-0.20	0.840	-.0833914	.0677755
L10.	-.0121032	.0383736	-0.32	0.752	-.0873141	.0631077
L11.	.0412775	.0387648	1.06	0.287	-.0347002	.1172552
L12.	-.1037747	.0379401	-2.74	0.006	-.1781359	-.0294135
L13.	.0576602	.0339123	1.70	0.089	-.0088068	.1241272
LNMonetaryBase						
L1.	1.174132	.0512394	22.91	0.000	1.073705	1.27456
L2.	-.1298758	.0790048	-1.64	0.100	-.2847223	.0249706
L3.	.1345952	.0784628	1.72	0.086	-.0191891	.2883794
L4.	-.1456303	.0777417	-1.87	0.061	-.2980013	.0067408
L5.	.0317426	.07756	0.41	0.682	-.1202722	.1837575
L6.	-.0657095	.0774228	-0.85	0.396	-.2174554	.0860365
L7.	.0433382	.077066	0.56	0.574	-.1077084	.1943849
L8.	.0132105	.0771007	0.17	0.864	-.1379041	.1643251
L9.	-.066912	.077514	-0.86	0.388	-.2188366	.0850126
L10.	.0647406	.0772968	0.84	0.402	-.0867583	.2162395
L11.	-.0159601	.0763906	-0.21	0.835	-.165683	.1337627
L12.	-.0683365	.0761903	-0.90	0.370	-.2176667	.0809937
L13.	.0305112	.0511294	0.60	0.551	-.0697006	.1307229
Constant	-.0133422	.0525867	-0.25	0.800	-.1164102	.0897258

Appendix 6

VAR with Policy rate

Sample:	1984m3 - 2017m12	Number of obs	= 406
Log likelihood =	5256.613	AIC	= -24.26903
FPE =	2.01e-17	HQIC	= -22.98021
Det(Sigma_ml) =	3.91e-18	SBIC	= -21.01264

Equation	Parameters	RMSE	R-square	chi2	P>chi2
EarlyPPI	66	.009754	0.9609	9972.394	0.0000
LatePPI	66	.003724	0.9994	633382.8	0.0000
EarlyProd	66	.01963	0.9885	34894.96	0.0000
LateProd	66	.025344	0.9639	10849.15	0.0000
PolicyRate	66	.236021	0.9796	19466.38	0.0000

	Coefficient	Std. Err.	z	P>|z|	[95% Conf.	Interval]
EarlyPPI						
EarlyPPI						
L1.	1.376728	.0516081	26.68	0.000	1.275578	1.477878
L2.	-.5351083	.0864505	-6.19	0.000	-.7045481	-.3656686
L3.	.0794303	.0884142	0.90	0.369	-.0938583	.2527189
L4.	.0639002	.0877868	0.73	0.467	-.1081587	.2359591
L5.	-.1122817	.0882525	-1.27	0.203	-.2852535	.0606901
L6.	-.0349145	.0878028	-0.40	0.691	-.2070049	.1371759
L7.	.0956816	.0873628	1.10	0.273	-.0755463	.2669095
L8.	.0059275	.0869052	0.07	0.946	-.1644036	.1762585
L9.	-.0237769	.0855092	-0.28	0.781	-.1913718	.143818

L10.	.1047059	.0859105	1.22	0.223	-.0636755	.2730873
L11.	-.1373501	.0869484	-1.58	0.114	-.3077658	.0330656
L12.	.1685345	.0847399	1.99	0.047	.0024473	.3346217
L13.	-.1018362	.0545511	-1.87	0.062	-.2087543	.005082
LatePPI						
L1.	.0592345	.1277968	0.46	0.643	-.1912426	.3097117
L2.	.0175793	.1934674	0.09	0.928	-.3616099	.3967685
L3.	.0854712	.194661	0.44	0.661	-.2960573	.4669998
L4.	.1478582	.19796	0.75	0.455	-.2401363	.5358527
L5.	-.5392021	.2010246	-2.68	0.007	-.9332031	-.1452011
L6.	.6276809	.2017755	3.11	0.002	.2322083	1.023154
L7.	-.1612494	.2016488	-0.80	0.424	-.5564739	.2339751
L8.	-.4653155	.2011023	-2.31	0.021	-.8594686	-.0711623
L9.	.4044763	.2044178	1.98	0.048	.0038249	.8051278
L10.	-.1458956	.2040849	-0.71	0.475	-.5458948	.2541035
L11.	-.139439	.204595	-0.68	0.496	-.5404378	.2615598
L12.	.0549855	.2031189	0.27	0.787	-.3431202	.4530912
L13.	.074682	.1353919	0.55	0.581	-.1906813	.3400454
EarlyProd						
L1.	.0128518	.0293469	0.44	0.661	-.0446671	.0703706
L2.	.0928981	.0324009	2.87	0.004	.0293935	.1564027
L3.	-.0699649	.0329175	-2.13	0.034	-.1344819	-.0054478
L4.	.0096771	.0332299	0.29	0.771	-.0554524	.0748066
L5.	-.0264134	.0331191	-0.80	0.425	-.0913255	.0384988
L6.	-.0082247	.0329293	-0.25	0.803	-.072765	.0563156
L7.	.0841038	.033738	2.49	0.013	.0179786	.150229
L8.	-.041748	.032911	-1.27	0.205	-.1062523	.0227563
L9.	-.0109862	.0318187	-0.35	0.730	-.0733497	.0513774
L10.	.0354773	.0316892	1.12	0.263	-.0266325	.0975871
L11.	-.0803147	.0317271	-2.53	0.011	-.1424988	-.0181307
L12.	.0952897	.0317084	3.01	0.003	.0331423	.1574371
L13.	-.0446121	.0264275	-1.69	0.091	-.0964092	.0071849
LateProd						
L1.	-.0443916	.0226212	-1.96	0.050	-.0887283	-.000055
L2.	.00322	.0239132	0.13	0.893	-.0436491	.0500891
L3.	.0092465	.0247857	0.37	0.709	-.0393326	.0578256
L4.	-.0167259	.0240886	-0.69	0.487	-.0639387	.0304869
L5.	.063891	.0240536	2.66	0.008	.0167469	.1110351
L6.	-.0299705	.0242605	-1.24	0.217	-.0775201	.0175792
L7.	-.0032987	.0245001	-0.13	0.893	-.051318	.0447205
L8.	-.0368391	.0245343	-1.50	0.133	-.0849255	.0112473
L9.	.0077326	.0243353	0.32	0.751	-.0399636	.0554289
L10.	.0294735	.02419	1.22	0.223	-.017938	.076885
L11.	-.0322629	.024334	-1.33	0.185	-.0799567	.0154309
L12.	.0052073	.0235695	0.22	0.825	-.040988	.0514026
L13.	.0043833	.0213596	0.21	0.837	-.0374807	.0462473
PolicyRate						
L1.	-.0000354	.0020538	-0.02	0.986	-.0040608	.00399
L2.	.0006466	.0027071	0.24	0.811	-.0046592	.0059525
L3.	.0020594	.0027126	0.76	0.448	-.0032571	.007376
L4.	.0000251	.0027234	0.01	0.993	-.0053127	.0053629
L5.	-.0026753	.002749	-0.97	0.330	-.0080631	.0027126
L6.	.0007955	.002753	0.29	0.773	-.0046003	.0061912
L7.	-.0011315	.002741	-0.41	0.680	-.0065039	.0042408
L8.	-.0034682	.0027287	-1.27	0.204	-.0088164	.00188
L9.	.0010163	.0027304	0.37	0.710	-.0043351	.0063678
L10.	.002714	.0026885	1.01	0.313	-.0025554	.0079834
L11.	.0002008	.0026182	0.08	0.939	-.0049308	.0053325
L12.	-.0014812	.0026146	-0.57	0.571	-.0066057	.0036432

L13.	.0008551	.0019715	0.43	0.664	-.003009	.0047191
Constant	.0258289	.0318721	0.81	0.418	-.0366392	.088297
LatePPI						
EarlyPPI						
L1.	-.0688341	.0197044	-3.49	0.000	-.1074539	-.0302143
L2.	-.0264517	.0330074	-0.80	0.423	-.091145	.0382416
L3.	.0790569	.0337572	2.34	0.019	.012894	.1452197
L4.	.0239259	.0335176	0.71	0.475	-.0417674	.0896192
L5.	-.0312649	.0336954	-0.93	0.353	-.0973067	.034777
L6.	.0580196	.0335238	1.73	0.084	-.0076858	.123725
L7.	-.0871028	.0333557	-2.61	0.009	-.1524789	-.0217268
L8.	.0401667	.033181	1.21	0.226	-.0248669	.1052003
L9.	-.0474486	.032648	-1.45	0.146	-.1114376	.0165403
L10.	.0661116	.0328012	2.02	0.044	.0018224	.1304009
L11.	-.0090879	.0331975	-0.27	0.784	-.0741538	.055978
L12.	-.0375668	.0323543	-1.16	0.246	-.1009801	.0258465
L13.	.0257302	.020828	1.24	0.217	-.0150919	.0665524
LatePPI						
L1.	1.139571	.0487937	23.35	0.000	1.043937	1.235205
L2.	-.0548197	.0738673	-0.74	0.458	-.1995969	.0899574
L3.	.1583268	.074323	2.13	0.033	.0126565	.3039972
L4.	-.2540144	.0755826	-3.36	0.001	-.4021535	-.1058753
L5.	-.0290495	.0767526	-0.38	0.705	-.179482	.1213829
L6.	-.0284057	.0770393	-0.37	0.712	-.1794	.1225886
L7.	.0244287	.076991	0.32	0.751	-.1264709	.1753282
L8.	.1581717	.0767823	2.06	0.039	.0076812	.3086622
L9.	-.1191937	.0780482	-1.53	0.127	-.2721654	.0337779
L10.	-.0646754	.0779211	-0.83	0.407	-.217398	.0880471
L11.	.0618626	.0781158	0.79	0.428	-.0912416	.2149669
L12.	.1297259	.0775523	1.67	0.094	-.0222737	.2817255
L13.	-.1247584	.0516936	-2.41	0.016	-.2260761	-.0234408
EarlyProd						
L1.	-.0072924	.0112049	-0.65	0.515	-.0292535	.0146687
L2.	-.014479	.0123709	-1.17	0.242	-.0387255	.0097675
L3.	-.0054055	.0125681	-0.43	0.667	-.0300386	.0192276
L4.	.0028313	.0126874	0.22	0.823	-.0220356	.0276982
L5.	.0205517	.0126451	1.63	0.104	-.0042322	.0453356
L6.	-.0191647	.0125727	-1.52	0.127	-.0438066	.0054773
L7.	.0172708	.0128814	1.34	0.180	-.0079763	.0425179
L8.	-.0197288	.0125656	-1.57	0.116	-.044357	.0048994
L9.	.026053	.0121486	2.14	0.032	.0022421	.0498639
L10.	.0015267	.0120992	0.13	0.900	-.0221873	.0252407
L11.	-.0109564	.0121137	-0.90	0.366	-.0346987	.0127859
L12.	-.018518	.0121065	-1.53	0.126	-.0422463	.0052103
L13.	.0210252	.0100902	2.08	0.037	.0012488	.0408017
LateProd						
L1.	-.0036014	.0086369	-0.42	0.677	-.0205294	.0133267
L2.	.0153284	.0091302	1.68	0.093	-.0025665	.0332234
L3.	.0071195	.0094634	0.75	0.452	-.0114284	.0256673
L4.	.0086832	.0091972	0.94	0.345	-.009343	.0267094
L5.	-.001475	.0091838	-0.16	0.872	-.0194749	.016525
L6.	.0104242	.0092628	1.13	0.260	-.0077306	.028579
L7.	-.0260406	.0093543	-2.78	0.005	-.0443747	-.0077065
L8.	.0119115	.0093674	1.27	0.204	-.0064482	.0302713
L9.	-.0201833	.0092914	-2.17	0.030	-.0383941	-.0019725
L10.	-.0002933	.0092359	-0.03	0.975	-.0183954	.0178087
L11.	.0022588	.0092909	0.24	0.808	-.0159511	.0204686
L12.	.0154079	.008999	1.71	0.087	-.0022298	.0330456
L13.	-.0105341	.0081552	-1.29	0.196	-.026518	.0054499

PolicyRate						
L1.	-.0011091	.0007842	-1.41	0.157	-.002646	.0004279
L2.	-.0007101	.0010336	-0.69	0.492	-.002736	.0013157
L3.	-.0007212	.0010357	-0.70	0.486	-.0027511	.0013087
L4.	.0031909	.0010398	3.07	0.002	.0011529	.0052289
L5.	-.000063	.0010496	-0.06	0.952	-.0021202	.0019941
L6.	.0011503	.0010511	1.09	0.274	-.0009098	.0032105
L7.	-.0011672	.0010465	-1.12	0.265	-.0032184	.000884
L8.	-.0011658	.0010418	-1.12	0.263	-.0032078	.0008762
L9.	.0005254	.0010425	0.50	0.614	-.0015178	.0025686
L10.	-.000221	.0010265	-0.22	0.830	-.0022329	.0017909
L11.	.0016988	.0009997	1.70	0.089	-.0002605	.0036581
L12.	-.0018494	.0009983	-1.85	0.064	-.003806	.0001071
L13.	.000691	.0007527	0.92	0.359	-.0007844	.0021663
Constant	.0148732	.012169	1.22	0.222	-.0089776	.038724
EarlyProd						
EarlyPPI						
L1.	-.0205376	.1038572	-0.20	0.843	-.2240941	.1830189
L2.	.1060619	.1739747	0.61	0.542	-.2349222	.4470459
L3.	.0647719	.1779265	0.36	0.716	-.2839575	.4135014
L4.	.1860561	.1766639	1.05	0.292	-.1601988	.532311
L5.	-.357188	.1776012	-2.01	0.044	-.7052799	-.0090961
L6.	-.089025	.1766962	-0.50	0.614	-.4353433	.2572932
L7.	.0111031	.1758106	0.06	0.950	-.3334793	.3556856
L8.	.0134545	.1748898	0.08	0.939	-.3293232	.3562322
L9.	.0129417	.1720804	0.08	0.940	-.3243298	.3502132
L10.	-.0420231	.172888	-0.24	0.808	-.3808773	.2968311
L11.	-.0229577	.1749767	-0.13	0.896	-.3659057	.3199903
L12.	.1808476	.1705324	1.06	0.289	-.1533897	.5150848
L13.	-.0070987	.1097797	-0.06	0.948	-.222263	.2080657
LatePPI						
L1.	.0202307	.2571809	0.08	0.937	-.4838347	.524296
L2.	-.6846599	.3893378	-1.76	0.079	-1.447748	.0784282
L3.	.6326507	.3917397	1.61	0.106	-.1351451	1.400446
L4.	-.4559538	.3983788	-1.14	0.252	-1.236762	.3248543
L5.	.6471122	.404546	1.60	0.110	-.1457834	1.440008
L6.	.3971528	.406057	0.98	0.328	-.3987044	1.19301
L7.	-.5244264	.4058023	-1.29	0.196	-1.319784	.2709314
L8.	.362619	.4047023	0.90	0.370	-.4305829	1.155821
L9.	-.4850077	.4113745	-1.18	0.238	-1.291287	.3212715
L10.	-.3269735	.4107047	-0.80	0.426	-1.13194	.477993
L11.	.4617046	.4117311	1.12	0.262	-.3452736	1.268683
L12.	-.6889722	.4087606	-1.69	0.092	-1.490128	.1121839
L13.	.611125	.2724655	2.24	0.025	.0771025	1.145148
EarlyProd						
L1.	.6586003	.0590583	11.15	0.000	.5428482	.7743524
L2.	-.1398276	.0652042	-2.14	0.032	-.2676255	-.0120296
L3.	.2952286	.0662438	4.46	0.000	.1653931	.425064
L4.	-.0185641	.0668726	-0.28	0.781	-.149632	.1125038
L5.	.0593577	.0666495	0.89	0.373	-.0712729	.1899883
L6.	.1109515	.0662677	1.67	0.094	-.0189308	.2408338
L7.	.028436	.067895	0.42	0.675	-.1046357	.1615078
L8.	-.0041825	.0662307	-0.06	0.950	-.1339922	.1256273
L9.	-.0245895	.0640327	-0.38	0.701	-.1500912	.1009123
L10.	-.2515856	.0637721	-3.95	0.000	-.3765766	-.1265946
L11.	.0368997	.0638483	0.58	0.563	-.0882407	.1620402
L12.	.5569859	.0638107	8.73	0.000	.4319193	.6820526
L13.	-.366898	.0531833	-6.90	0.000	-.4711354	-.2626605

LateProd						
L1.	.0745557	.0455233	1.64	0.101	-.0146683	.1637796
L2.	.1831972	.0481235	3.81	0.000	.0888769	.2775175
L3.	-.1180956	.0498793	-2.37	0.018	-.2158571	-.020334
L4.	-.0926248	.0484764	-1.91	0.056	-.1876367	.0023872
L5.	-.0971655	.0484059	-2.01	0.045	-.1920393	-.0022917
L6.	.2057679	.0488223	4.21	0.000	.110078	.3014578
L7.	-.1258757	.0493045	-2.55	0.011	-.2225106	-.0292407
L8.	-.0898811	.0493734	-1.82	0.069	-.1866512	.0068889
L9.	-.0267977	.0489728	-0.55	0.584	-.1227827	.0691872
L10.	.2017316	.0486804	4.14	0.000	.1063196	.2971435
L11.	.0452664	.0489703	0.92	0.355	-.0507135	.1412464
L12.	.0106208	.0474317	0.22	0.823	-.0823436	.1035851
L13.	-.1383495	.0429844	-3.22	0.001	-.2225974	-.0541015
PolicyRate						
L1.	.0022133	.0041332	0.54	0.592	-.0058875	.0103142
L2.	.0082464	.0054478	1.51	0.130	-.0024312	.018924
L3.	-.0142888	.0054588	-2.62	0.009	-.0249879	-.0035896
L4.	.0018162	.0054807	0.33	0.740	-.0089257	.0125581
L5.	-.0113611	.0055321	-2.05	0.040	-.0222037	-.0005185
L6.	.0054495	.0055402	0.98	0.325	-.0054091	.016308
L7.	-.0025303	.0055161	-0.46	0.646	-.0133417	.0082811
L8.	.0046569	.0054913	0.85	0.396	-.0061058	.0154197
L9.	.0031064	.0054947	0.57	0.572	-.007663	.0138757
L10.	.0061144	.0054104	1.13	0.258	-.0044898	.0167186
L11.	-.0108197	.005269	-2.05	0.040	-.0211468	-.0004927
L12.	.0043577	.0052616	0.83	0.408	-.0059548	.0146702
L13.	.0020531	.0039675	0.52	0.605	-.005723	.0098292
Constant	.0236719	.06414	0.37	0.712	-.1020402	.149384
LateProd						
EarlyPPI						
L1.	-.0691378	.1340923	-0.52	0.606	-.3319538	.1936781
L2.	-.10317	.2246223	-0.46	0.646	-.5434216	.3370816
L3.	.2421765	.2297246	1.05	0.292	-.2080754	.6924284
L4.	.1979256	.2280945	0.87	0.386	-.2491313	.6449825
L5.	-.3613512	.2293046	-1.58	0.115	-.81078	.0880775
L6.	.0288034	.2281362	0.13	0.900	-.4183353	.475942
L7.	-.0351165	.2269927	-0.15	0.877	-.4800141	.4097811
L8.	-.0250858	.2258039	-0.11	0.912	-.4676532	.4174816
L9.	.2410314	.2221766	1.08	0.278	-.1944269	.6764896
L10.	-.1385456	.2232192	-0.62	0.535	-.5760473	.2989561
L11.	-.3319609	.225916	-1.47	0.142	-.7747482	.1108264
L12.	.3310362	.2201779	1.50	0.133	-.1005045	.7625769
L13.	-.0102012	.1417389	-0.07	0.943	-.2880044	.2676019
LatePPI						
L1.	.0135232	.3320517	0.04	0.968	-.6372861	.6643325
L2.	.0477925	.5026822	0.10	0.924	-.9374465	1.033031
L3.	-.8804865	.5057833	-1.74	0.082	-1.871804	.1108306
L4.	.6580245	.5143551	1.28	0.201	-.350093	1.666142
L5.	-.0185385	.5223178	-0.04	0.972	-1.042263	1.005186
L6.	1.155888	.5242687	2.20	0.027	.1283403	2.183436
L7.	-1.466752	.5239397	-2.80	0.005	-2.493655	-.4398486
L8.	.7956197	.5225196	1.52	0.128	-.2284998	1.819739
L9.	-.4441001	.5311342	-0.84	0.403	-1.485104	.5969037
L10.	-.6199147	.5302694	-1.17	0.242	-1.659224	.4193942
L11.	.9432152	.5315946	1.77	0.076	-.0986911	1.985122
L12.	-1.024204	.5277593	-1.94	0.052	-2.058593	.0101852
L13.	.7616725	.3517859	2.17	0.030	.0721848	1.45116
EarlyProd						

L1.	.0075485	.0762514	0.10	0.921	-.1419014	.1569985
L2.	-.2499137	.0841865	-2.97	0.003	-.4149163	-.0849111
L3.	.1425838	.0855287	1.67	0.095	-.0250495	.310217
L4.	-.0556603	.0863406	-0.64	0.519	-.2248848	.1135642
L5.	-.1038302	.0860525	-1.21	0.228	-.2724901	.0648296
L6.	.3686315	.0855596	4.31	0.000	.2009378	.5363253
L7.	-.1215602	.0876606	-1.39	0.166	-.2933718	.0502515
L8.	.0027465	.0855118	0.03	0.974	-.1648535	.1703466
L9.	-.03745	.0826739	-0.45	0.651	-.1994879	.1245879
L10.	.0358931	.0823375	0.44	0.663	-.1254854	.1972715
L11.	-.0863156	.0824359	-1.05	0.295	-.247887	.0752559
L12.	.1014698	.0823873	1.23	0.218	-.0600063	.262946
L13.	-.001729	.0686661	-0.03	0.980	-.1363121	.1328541
LateProd						
L1.	.6073452	.058776	10.33	0.000	.4921463	.7225441
L2.	.3656179	.0621332	5.88	0.000	.2438391	.4873968
L3.	-.0752328	.0644002	-1.17	0.243	-.2014548	.0509891
L4.	-.1394845	.0625888	-2.23	0.026	-.2621563	-.0168126
L5.	.0836494	.0624978	1.34	0.181	-.0388442	.2061429
L6.	.0515766	.0630355	0.82	0.413	-.0719707	.1751238
L7.	-.0263764	.063658	-0.41	0.679	-.1511438	.098391
L8.	-.1003669	.063747	-1.57	0.115	-.2253087	.0245749
L9.	-.1056912	.0632298	-1.67	0.095	-.2296194	.018237
L10.	.1260266	.0628523	2.01	0.045	.0028383	.2492149
L11.	.1563065	.0632265	2.47	0.013	.0323848	.2802282
L12.	.4513371	.06124	7.37	0.000	.3313088	.5713653
L13.	-.5235975	.0554981	-9.43	0.000	-.6323718	-.4148233
PolicyRate						
L1.	.0000757	.0053364	0.01	0.989	-.0103835	.0105349
L2.	-.0044335	.0070338	-0.63	0.528	-.0182195	.0093525
L3.	-.0050983	.007048	-0.72	0.469	-.0189122	.0087155
L4.	.0011773	.0070762	0.17	0.868	-.0126918	.0150464
L5.	-.0166772	.0071425	-2.33	0.020	-.0306763	-.0026781
L6.	.0112852	.007153	1.58	0.115	-.0027345	.0253049
L7.	.0109008	.007122	1.53	0.126	-.003058	.0248597
L8.	-.0035802	.0070899	-0.50	0.614	-.0174762	.0103158
L9.	-.0060364	.0070943	-0.85	0.395	-.019941	.0078681
L10.	.0045829	.0069855	0.66	0.512	-.0091084	.0182741
L11.	-.0028605	.0068029	-0.42	0.674	-.0161939	.010473
L12.	.0063599	.0067934	0.94	0.349	-.0069549	.0196746
L13.	.0013975	.0051225	0.27	0.785	-.0086424	.0114373
Constant	.2492698	.0828125	3.01	0.003	.0869603	.4115793
PolicyRate						
EarlyPPI						
L1.	1.792721	1.248746	1.44	0.151	-.6547766	4.240218
L2.	-1.729503	2.091815	-0.83	0.408	-5.829385	2.37038
L3.	3.033766	2.139331	1.42	0.156	-1.159245	7.226777
L4.	-3.180538	2.12415	-1.50	0.134	-7.343795	.9827195
L5.	.8944947	2.135419	0.42	0.675	-3.29085	5.07984
L6.	.1187912	2.124538	0.06	0.955	-4.045228	4.28281
L7.	-.8413814	2.11389	-0.40	0.691	-4.98453	3.301767
L8.	.0443434	2.102819	0.02	0.983	-4.077105	4.165792
L9.	-.1746354	2.06904	-0.08	0.933	-4.229879	3.880608
L10.	-3.821545	2.078749	-1.84	0.066	-7.895819	.2527285
L11.	3.586403	2.103863	1.70	0.088	-.5370935	7.709899
L12.	-.9171158	2.050426	-0.45	0.655	-4.935877	3.101645
L13.	1.003896	1.319956	0.76	0.447	-1.583171	3.590963
LatePPI						
L1.	-4.803725	3.092261	-1.55	0.120	-10.86444	1.256994

L2.	4.779921	4.681273	1.02	0.307	-4.395204	13.95505
L3.	-7.406129	4.710152	-1.57	0.116	-16.63786	1.825601
L4.	3.081854	4.789978	0.64	0.520	-6.306331	12.47004
L5.	5.492811	4.864131	1.13	0.259	-4.040711	15.02633
L6.	-2.067179	4.882299	-0.42	0.672	-11.63631	7.501951
L7.	4.066632	4.879236	0.83	0.405	-5.496494	13.62976
L8.	-8.293285	4.86601	-1.70	0.088	-17.83049	1.24392
L9.	-.3352239	4.946234	-0.07	0.946	-10.02966	9.359217
L10.	16.47569	4.938181	3.34	0.001	6.797032	26.15435
L11.	-7.729669	4.950523	-1.56	0.118	-17.43252	1.973177
L12.	-1.791509	4.914806	-0.36	0.715	-11.42435	7.841334
L13.	-1.924771	3.276038	-0.59	0.557	-8.345687	4.496144
EarlyProd						
L1.	.9843142	.7100977	1.39	0.166	-.4074517	2.37608
L2.	-.4710167	.7839947	-0.60	0.548	-2.007618	1.065585
L3.	-.8806722	.796494	-1.11	0.269	-2.441772	.6804274
L4.	.196862	.8040547	0.24	0.807	-1.379056	1.77278
L5.	-.3976612	.8013719	-0.50	0.620	-1.968321	1.172999
L6.	1.186045	.7967814	1.49	0.137	-.3756176	2.747708
L7.	.0610541	.8163474	0.07	0.940	-1.538957	1.661066
L8.	-.3319555	.7963364	-0.42	0.677	-1.892746	1.228835
L9.	-.9873947	.7699083	-1.28	0.200	-2.496387	.5215979
L10.	1.295464	.7667749	1.69	0.091	-.207387	2.798315
L11.	-.4994912	.767692	-0.65	0.515	-2.00414	1.005157
L12.	.2535825	.7672392	0.33	0.741	-1.250179	1.757344
L13.	-.534917	.6394593	-0.84	0.403	-1.788234	.7184003
LateProd						
L1.	-1.628367	.5473571	-2.97	0.003	-2.701167	-.5555666
L2.	1.089673	.5786211	1.88	0.060	-.0444034	2.22375
L3.	.1227219	.5997323	0.20	0.838	-1.052732	1.298175
L4.	-.3895239	.5828641	-0.67	0.504	-1.531917	.7528687
L5.	.839924	.5820168	1.44	0.149	-.300808	1.980656
L6.	-.178159	.5870233	-0.30	0.762	-1.328703	.9723856
L7.	-.5868179	.5928209	-0.99	0.322	-1.748726	.5750898
L8.	-.3154962	.5936497	-0.53	0.595	-1.479028	.8480359
L9.	.8075183	.5888333	1.37	0.170	-.3465738	1.96161
L10.	-1.045864	.585318	-1.79	0.074	-2.193066	.1013381
L11.	-.0353611	.5888026	-0.06	0.952	-1.189393	1.118671
L12.	-.4599395	.5703031	-0.81	0.420	-1.577713	.657834
L13.	1.213646	.5168309	2.35	0.019	.2006766	2.226616
PolicyRate						
L1.	.924128	.0496958	18.60	0.000	.826726	1.02153
L2.	.0083	.065503	0.13	0.899	-.1200836	.1366835
L3.	.2046005	.0656353	3.12	0.002	.0759576	.3332433
L4.	-.1231909	.0658976	-1.87	0.062	-.2523478	.005966
L5.	-.0299711	.0665156	-0.45	0.652	-.1603393	.1003971
L6.	.070188	.0666132	1.05	0.292	-.0603715	.2007476
L7.	-.0668464	.0663242	-1.01	0.314	-.1968393	.0631466
L8.	.0320677	.0660255	0.49	0.627	-.09734	.1614753
L9.	.0412706	.066066	0.62	0.532	-.0882164	.1707576
L10.	-.0296751	.0650528	-0.46	0.648	-.1571764	.0978261
L11.	-.0176198	.0633526	-0.28	0.781	-.1417887	.1065491
L12.	-.3439045	.0632637	-5.44	0.000	-.4678991	-.21991
L13.	.2881377	.0477035	6.04	0.000	.1946405	.3816348
Constant	1.406151	.7711988	1.82	0.068	-.1053704	2.917673

Appendix 7

Descriptive statistics

Primary PPI

	Percentiles	Smallest		
1%	87.2	86.5		
5%	88.6	86.7		
10%	90.3	86.8	Obs	419
25%	95.2	87	Sum of Wgt.	419
50%	98.1		Mean	98.80358
		Largest	Std. Dev.	6.303292
75%	102.9	121.4		
90%	106.8	122.8	Variance	39.73149
95%	108.7	125.4	Skewness	.6917882
99%	118.6	126.6	Kurtosis	4.629777

Intermediate PPI

	Percentiles	Smallest		
1%	86.1	85.9		
5%	86.4	86		
10%	88.1	86	Obs	419
25%	92.4	86	Sum of Wgt.	419
50%	97.1		Mean	96.80358
		Largest	Std. Dev.	6.293835
75%	100.4	110.2		
90%	105.4	110.3	Variance	39.61235
95%	109.7	110.9	Skewness	.2694707
99%	110.2	111.4	Kurtosis	2.601542

Finished PPI

	Percentiles	Smallest		
1%	98.8	98.5		
5%	99.5	98.6		
10%	100.8	98.7	Obs	419
25%	103.9	98.7	Sum of Wgt.	419
50%	116.6		Mean	115.5169
		Largest	Std. Dev.	11.92651
75%	127.5	133.3		
90%	130.9	133.3	Variance	142.2416
95%	132.4	133.6	Skewness	.0402006
99%	133.2	133.7	Kurtosis	1.389026

Mining production

	Percentiles	Smallest		
1%	60.8	56.4		
5%	68.4	59.3		
10%	72	60.1	Obs	419
25%	83.9	60.3	Sum of Wgt.	419
50%	92.1		Mean	91.38831
		Largest	Std. Dev.	12.78769
75%	100.2	120		
90%	106.4	120.3	Variance	163.5251
95%	111.3	120.6	Skewness	-.295954
99%	117.8	121.4	Kurtosis	2.727765

Investment good production

	Percentiles	Smallest		
1%	79.8	70		
5%	88.6	72.2		
10%	92.1	74	Obs	419

25%	101.8	79.8	Sum of Wgt.	419
50%	113.4		Mean	115.7663
		Largest	Std. Dev.	19.17222
75%	127.1	170.6		
90%	142.1	170.6	Variance	367.5741
95%	149.5	175.1	Skewness	.5401764
99%	167.4	182.6	Kurtosis	3.21074

Consumer good production

	Percentiles	Smallest		
1%	82	73.4		
5%	88.5	78.4		
10%	91.1	78.9	Obs	419
25%	98	80.2	Sum of Wgt.	419
50%	106.1		Mean	104.6506
		Largest	Std. Dev.	9.564161
75%	111.6	124.4		
90%	116.2	125.8	Variance	91.47318
95%	118.9	127	Skewness	-.3969492
99%	123	127.2	Kurtosis	2.796902

GDP gap

	Percentiles	Smallest		
1%	-6	-6.14		
5%	-3.02	-6.14		
10%	-2.36	-6.14	Obs	419
25%	-1.39	-6	Sum of Wgt.	419
50%	-.38		Mean	-.242506
		Largest	Std. Dev.	1.971795
75%	.75	4.94		
90%	2.39	5.04	Variance	3.887974
95%	4.05	5.04	Skewness	.3020141
99%	4.94	5.04	Kurtosis	4.098755

Inflation

	Percentiles	Smallest		
1%	-1.9	-2.5		
5%	-1	-2.2		
10%	-.7	-2.2	Obs	419
25%	-.3	-2.2	Sum of Wgt.	419
50%	.3		Mean	.6463007
		Largest	Std. Dev.	1.28001
75%	1.6	3.7		
90%	2.5	3.8	Variance	1.638425
95%	3	4	Skewness	.549896
99%	3.6	4.2	Kurtosis	2.69543

Short-term target “Policy rate”

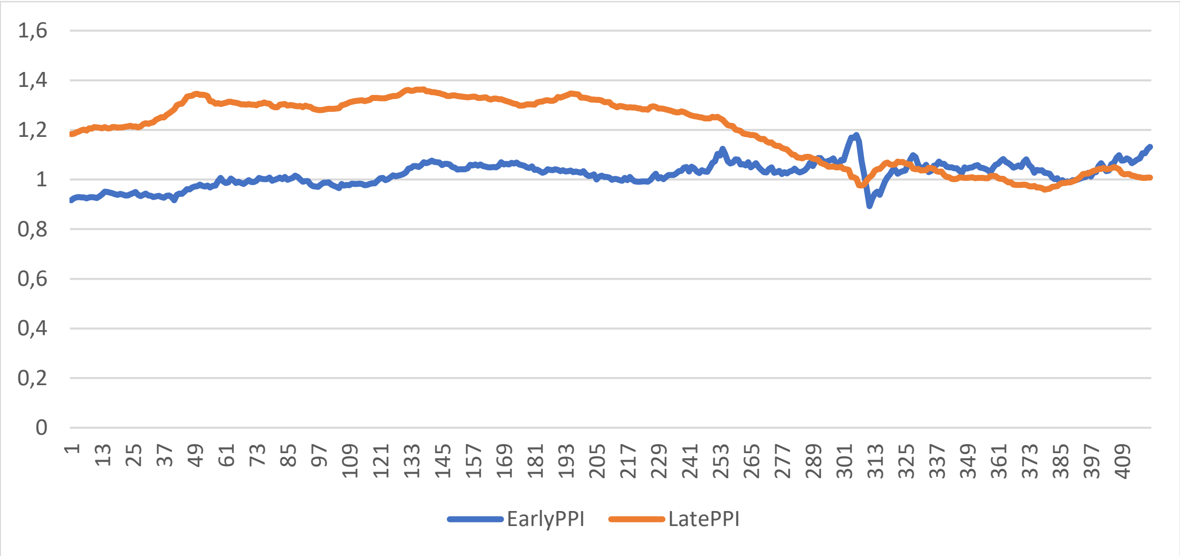
	Percentiles	Smallest		
1%	-.1	-.1		
5%	-.1	-.1		
10%	0	-.1	Obs	419
25%	0	-.1	Sum of Wgt.	419
50%	.25		Mean	1.417661
		Largest	Std. Dev.	1.922465
75%	2.5	6		
90%	5	6	Variance	3.695872
95%	5.5	6	Skewness	1.132426
99%	6	6	Kurtosis	2.796103

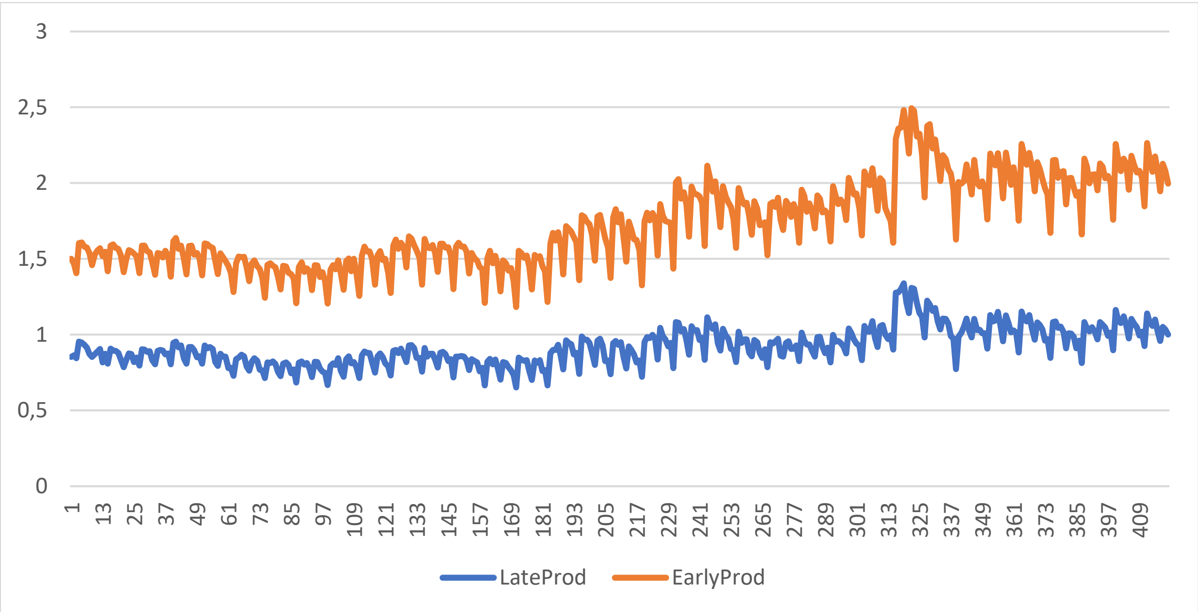
Monetary base

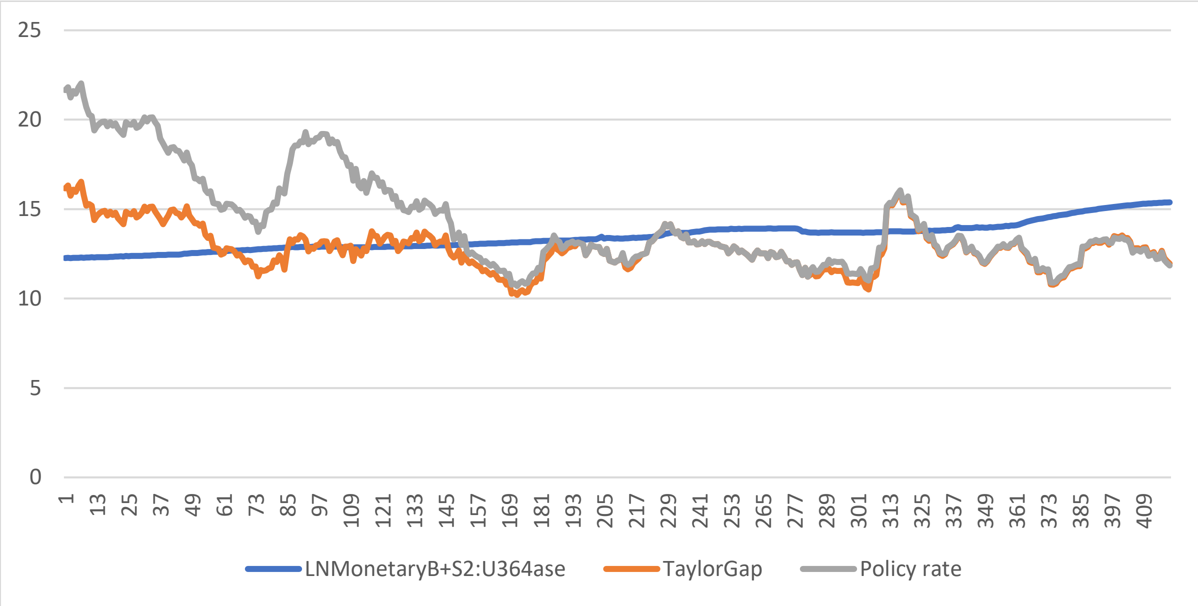
	Percentiles	Smallest

1%	214383	211820		
5%	229523	212230		
10%	256781	213615	Obs	419
25%	394445	213987	Sum of Wgt.	419
50%	643320		Mean	988116.5
		Largest	Std. Dev.	1006025
75%	1085501	4696904		
90%	2373120	4723912	Variance	1.01e+12
95%	3752664	4743917	Skewness	2.288027
99%	4652217	4774490	Kurtosis	7.675898

Appendix 8







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LNMonetaryB+S2:U364ase
TaylorGap
Policy rate