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– Estimation of short and long run elasticites

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Abstract

The Swedish aggregated hog supply has been in a steadily decreasing trend during the last twenty years. In this paper the Swedish price supply relationship is examined to find elasticities for the market. The estimation of the supply function is made using AR (1) regression. The prices of inputs are made out of feed prices and the prices of output are the price paid to the producer. A risk variable is introduced to account for short term price fluctuations, however the risk variable shows no significance. The period that is studied is 1996-2015 and analyses quarterly data. The results suggest that the Swedish elasticities are in line with prior estimates in other hog markets in the world. The conclusion drawn is that the relationship between prices and supply are positive. Further research is proposed with further refined methods and more variables included to confirm the results of this paper.

Sammanfattning

Det svenska aggregerade utbudet av fläskkött har varit i en ständigt nedgående trend under de senaste tjugo åren. I denna uppsats undersöks den svenska pris- och utbudsrelationen och elasticiteten för den svenska grismarknaden föreslås. Estimeringen av den svenska utbudsfunktionen utförs genom AR(1) regression. Inputpriserna utgörs av foderpriser och produktpriserna utgörs av slaktsvinspriser. En riskvariabel introduceras för att räkna på korta fluktuationer i priserna och producenternas reaktioner kring detta, riskvariabeln visade ingen signifikans i resultatet. Studien sträcker sig mellan 1996-2015 och analyserar kvartalsdata. Resultaten visar på att elasticiteten på den svenska grismarknaden ligger i samma spann som internationella marknader. Slutsatsen som dras är att pris och utbudsrelationen är positiv. Det föreslås ytterligare undersökningar med fler variabler och en mer utvecklad metod för att bekräfta dessa resultat.

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1 Introduction

The Swedish aggregated hog production has been decreasing throughout the last few years. In January 2011, a hundred hog producers shut down their production due to low prices (Nilsson, 2011). As a reaction to the crisis during January 2011 the Swedish government released a payment called suggpengen to support Swedish producers (Teddestedt, 2011). This payment was meant to support the Swedish producers because of their higher costs in animal welfare compared to other countries in the EU. The payment consisted of 1150 Swedish crowns that was received for each sow the producer held.

In this research an examination of the Swedish aggregated hog market will be performed to answer the research question w*hat is the price supply relationship on the Swedish aggregated hog market?* The aim is to find short and long run elasticities of the Swedish hog market. The hypothesis is that there is a positive relationship between prices and supply. Knowledge of how the elasticity acts on the Swedish market might be useful in the future. For example, it might be helpful to form correct policies that can support the market. To answer the research question quarterly data of the hog market from 1996 until 2015 is analyzed. Similar studies have been performed on other markets in the world.

In 2014 an analysis of the Canadian hog market was made (Rude & Surry, 2014). The analysis consisted of finding the supply response on the hog market with respect to fluctuations in prices. Supply responses meaning the relationship in-between prices and supply. A lag of nine months on prices was added in the model that was developed. This lag was added to account for the time it takes from the decision to produce until the product actually enters the market. The short run elasticities for expected feed price with respect to supply were in-between 0,118-0,205 for the four different regions of Canada that the paper investigated.

Rezitis and Stavropoulos (2009) did a similar research on the Greek hog market and the results were comparable to the results found by Rude and Surry. The value of the short run elasticity was 0,062 and the long run elasticity 0,315. In the paper by Rezitis and Stavropoulos long run elasticity was derived due to the use of lag dependent variables in their model. A similar study as the one performed on the Greek market was performed by Holt and Moschini (1992) on the US market. The findings by Holt and Moschini show similar elasticities as in the previously mentioned studies with values of short run elasticity of 0,172 and long run elasticity of 1,92.

In all the papers previously mentioned a general autoregressive heteroscedasticity model (GARCH) was used to deal with the risk and price expectations a famer faces. The fact that all of the papers included a risk model approach implies that it is important to include risk modelling when predicting hog supply response and an attempt of doing this is included in this paper.

In 2012 a study was performed to predict an annual supply function of the Chinese hog market (Liang, Liu & Yang, 2015). In the model, they made several tests to see which factors have an impact on the hog supply in the Chinese market. Four factors were found to have a greater impact. These were hog price, prices of inputs in hog production, the level of hog inventory and emergency policies (e.g. earthquakes but also certain subventions). The prices of inputs were mainly represented by the price of hog feed. The findings in the paper shows that the hog market supply function can be estimated using lag variables and input prices which partly is applied in this paper.

The gap to be filled by this paper is the lack of knowledge of how Swedish producers react to variations in prices. In the literature review no research of the Swedish elasticity of supply was found. A few limitations have been added to fulfill the work. This paper only focus on the Swedish hog market and does not include other meat or international markets. The research also only focuses on the finished hogs and does not include furrow farmers.

The disposition of the thesis is as follows. First the theoretical model is presented. This is followed by a discussion of some econometric issues regarding time series data. The empirical model is then presented with data explanation and variable selection. This is followed by results, results discussion and conclusion.

2 Theoretical model

This chapter consists of two sections. The first section introduces the theoretical model and the basic concepts of the supply function. The second section introduces the risk approach that was used in the empirical model.

2.1 Basic model

To fully answer the question *what is the price supply relationship on the Swedish aggregated hog market,* it is necessary to know the shape of the agricultural supply function. The agricultural supply function is proposed to hold the following shape by Tomek and Robinson in the book *Agricultural product prices* (1992):

$$Q_s (P_i, P_o) = C + \beta_1 P_i - \beta_2 P_o. \qquad (1)$$

Where C, β_1 and β_2 are parameters of the equation, P_o are prices of outputs and P_i are prices of inputs. This equation can be interpreted as if the producer sets its mind on production based on both input and output prices. This implies that both the input and output prices are important measurements of what the farmer supply.

Considering equation one and bearing in mind that a raise in P_o can erase a raise in P_i a refined way of writing equation one is proposed below in equation two.

$$Qs (P_i, P_o) = C + \beta_1 (P_o / P_i) \qquad (2)$$

In the refined supply equation the ratio of the output prices with respect to the input prices are calculated as the independent variable. This application of agricultural supply was proposed by Tomek and Robinson (1992) and it is thought to better reflect the decision making of the farmer.

Something more that needs to be considered in agricultural supply is the time from the decision making until the product actually reaches the market. Rude and Surry (2014) argues that the decision to produce is made prior to when the product enters the market. This makes it necessary to enter a lagged price in the hog supply function. In equation 3 below a lag price has been added. This is denoted as $P_{i\ t-n}$ / $P_{o\ t-n}$ in equation three. This price can be lagged forward as many periods as necessary, however in hog production a regular lag that is used is nine months (Rude and Surry, 2015). Which when dealing with quarterly data would mean a three-period lag. In equation three the lag is written in general terms.

$$Qs\ (P_i, P_o) = C + \beta_1(P_o / P_i) + \beta_2(P_{i\ t-n} / P_{o\ t-n}) \qquad (3)$$

In agricultural supply of animal goods, it is likely that the quantity supplied in the prior period has a great impact on the current quantity that is supplied (Liang et al, 2015). This since it is capital intensive and it takes time for the farmers to adapt the technology to new prices and production levels. Thus it is good to introduce a variable that accounts for how the market reacts to previous quantities. This is known as a lag dependent variable and is commonly used in hog supply theory. It helps to determine the adjustment rate of the market and is necessary to derive long run elasticities (Rezitis and Stavropoulos, 2009). Adjustment rate meaning how fast the market reacts to a raise or drop in prices. High values on the parameters of the dependent lag variable implies a slow adjustment rate, whilst low values of the parameter imply quicker adjustment rate. In equation four a lag dependent variable has been added that is lagged forward one period.

$$Qs = C + \beta_1(P_o / P_i) + \beta_2(P_{i\ t-n} / P_{o\ t-n}) + \beta_5 Qs_{t-1} + e_1 \qquad (4)$$

Equation four should be considered to represent the agricultural supply when dealing with livestock farming. However as mentioned in the introduction it is necessary to introduce something to deal with the uncertainty that the farmer faces. This leads us to the next chapter dealing with *hog supply and uncertainty*.

2.2 Hog supply and uncertainty

Since the farmers face fluctuations in prices it is important to account for these fluctuations when estimating a supply function (Rezitis and Stavropoulos, 2009). A variable that explains some of the uncertainty of prices that a farmer faces will help measure the risk attitude. It can measure whether the producers are risk averse, risk positive or risk neutral (Moss, 2010). In this section a simple model is developed to find the farmers reaction to short run fluctuations in prices and the uncertainty this represents.

The risk-model built up in this paper is a simpler approach than the ones developed by Rude and Surry (2014) and Rezitis and Stavropoulos (2009). The theory is that by running a regression of the time series data of monthly hog prices against eleven dummy variables and a time trend variable the fluctuations over time will be captured. The fluctuations over time will be captured in the residuals of the regression. Since these fluctuations in a way can measure the price expectations in the future and how the farmer reacted to them it is a simple measurement of how the farmers react to uncertainty and volatility in prices.

$$P^{hog} = C + time + B_1 Dummy_{month2} + \dots + B_2 Dummy_{month12} + e_t$$
(5)

The equation consists of the price of hog that is run against 11 dummy variables, a time floating variable and a constant. To avoid the dummy variable trap the first dummy variable was excluded and a constant was included (Guajarati, PP 293, 2009). The e_t variable included in the model is the standard error term of the regression where expected value is 0. The regression is proposed to be done by ordinary least squares (OLS).

3 Econometric issues

This chapter introduces the reader to some of the basic concepts of time series modelling. It introduces lag variables and explains the concept of stationarity.

3.1 Time series and lag variables

A time series is a series of data observations listed in chronological order of time (Stock and Watson, 2007). By processing and analyzing time series data one can expect to find relationships between the data of consideration. To perform a time series analysis it is necessary to introduce lag variables and check the stationarity of the times series (Guajarati, 2009). Both terms will be explained in the following section.

The introduction of lag variables in time series modelling is important, since without it one would not know how the dependent variable reacts to values of the dependent and the independent variables in previous periods of time (Guajarati, 2009). A basic lagged model is presented below in equation six.

$$Y = C + \beta 1 X_t + \beta 2 X_{t-1} \quad (6)$$

In equation six it is expected that the dependent variable relies on changes of X_t and X_{t-1}. The variable X_{t-1} represents this input lagged forward one period. This model can be extended to include more lag variables or variables that are lagged more periods. In this model Y is dependent on both X_t, which represents X in the current period, and X_{t-1} which is the value that X held one period prior. The length of the period depends on the frequency of the data.

If the frequency is monthly data one period could be set as one month, and if it is quarterly data one period would be a quarter.

Another important characteristic of a time series is whether it is stationary or not. It is important that a time series is stationary to use it for prediction (Stock & Watson, 2007). If the time series is not stationary it can lead to spurious regression (Guajarati, pp 748, 2009). Spurious regression meaning that you could get a high significance and r^2 in the regression even though the two variables have nothing in common.

A typical case of a non-stationary time series is shown in the equations seven and eight.

$$Y_1 = Y_0 + u_1 \qquad (7)$$

$$Y_2 = Y_1 + u_2 = Y_0 + u_1 + u_2 \qquad (8)$$

As can be seen in equation seven and eight the error term from the first period is the only thing influencing the forecast of the second period's Y (Guajarati, 2009). This is a typical example of a non-stationary time-series, and it is not suitable for prediction. This type of time series is known to have a unit root and needs further investigation.

The first thing one should do to check for stationarity is to plot the time series data to see if it seems to violate the rules of stationarity. One way to notice if it violates the rules is whether it stays around the same mean or not. If it seems to violate the rule of staying around the same mean it is necessary to investigate the time-series further.

The Augmented Dickey-Fuller (ADF) tests for the existence of unit root in the time series (Guajarati, 2009). It will check for a unit root with the null hypothesis of a unit-root $H0$: ϕ=1 alternatively $H1$: ϕ=0. The null hypothesis is that there is a unit root, and the alternative is that you can reject the unit root. If the null hypothesis is rejected the stationarity is established.

4 Method

This section is divided into three sections. The first section explains the empirical model that was used to estimate the hog supply function. The second part presents a prediction of the signs of the parameters in the equation. The third part presents where data was found and the fourth part explains how the long run elasticity was calculated.

4.1 Empirical model

Presented below in equation nine is the final version of the proposed model that was used to predict the aggregated hog supply.

$$Qs = C + \beta_1(P_{i\ t-3}/P_{o\ t-3}) + \beta_2 Qs_{t-1} + \beta_3 D_1 + \beta_4 D_2 + \beta_5 D_3 + \beta_7 RiskR + e_1 \quad (9)$$

Quantity supplied, Qs, is the actual quantity supplied on the market. C is a constant, $P_{i\ t-3}/P_{o\ t-3}$ are the prices from the prior period. Qs_{t-1} is the lag dependent variable. D_1, D_2, D_3 are dummies included to account for seasonal variations. The dummy variables are binary variables that either take the value of one or zero (Guajarati, 2009). The seasons are accounted to be spring, summer, fall, and winter. Only three seasonal dummies were used to avoid the dummy variable trap (Guajarati, PP 293, 2009). β_1, β_2, β_3, β_4, β_5, and β_6 are the parameters to be estimated. It should be noted that this model differs from the model proposed in the theoretical chapter since prices from the current period is not included. A model with current prices was run and the current price did not turn out to be significant and it was excluded in the empirical model.

The riskvariable, RiskR, included in the model was calculated using the residuals from running the price of hog against eleven separate dummy variables and a constant. The residuals were then converted into quarterly data by adding up the three residuals of each quarter and dividing these by three. This calculation was performed for year 1996:1 until 2015:12. In this way a mean residual for each quarter was received.

To get the results in elasticities equation nine was transformed into natural logarithmic form and is shown in equation ten. The regression was run using AR(1) regression in Gretl.

$$Ln(Qs) = C + \beta_1 Ln(P_{i\ t-3} / P_{o\ t-3}) + \beta_2 LnQs_{t-1} + \beta_3 D_1 + \beta_4 D_2 + \beta_5 D_3 + \beta_6 LnRiskR + e_1 \quad (10)$$

4.2 Selected variables and expected signs

To find the relationship between quantity supplied and the prices a few variables were chosen based upon the literature review. This part will predict signs on the variables and give some brief information on the variables. The dummy variables are not predicted since it is difficult to predict what signs these variables will hold.

$Ln(P_{i\ t-3} / P_{o\ t-3})$ – This variable is the ratio of the price of output prices with respect to input prices. Expected sign is positive. The price from nine months away is expected to have an impact on the supply, therefore a lag of three periods was chosen. The argument to use the ratio of the prices were proposed by Tomek and Robinson (1992) and is supposed to be a good measurement of costs. The lag period of three periods was chosen since this would represent the time from deciding to produce until it enters the market (Rude and Surry, 2015).

$LnQs_{t-1}$ – This is the lag dependent variable. Since the hog market has been in a downward going trend this sign is expected to be positive but below one. This variable was included to be able to derive long run elasticity. It was included as a variable in the model of the Chinese hog market by Liang et al (2015) and the Greek market by Rezitis and Stavropoulos (2009).

Seasonal dummies D_1, D_2, D_3 – The dummy variables will not be predicted since these are rather hard to predict. These variables were included to account for seasonalities in the data. D_1 activates in quarter 2, D_2 activates in quarter three and D_3 activates in quarter four.

LnRiskR – This variable is as well difficult to predict. The variable will show how the farmers react to short term risk. It will explain whether a short price fluctuation causes the farmers to raise their supply or not.

4.3 Data and data sources

The aim of this paper is to find short and long run elasticities of the Swedish hog market. To do this, data was collected for different variables that is thought to have an impact on hog production. These variables were chosen based on the literature and mainly inspired by the work of Liang et al (2015). The data was retrieved from the Swedish board of agriculture (Jordbruksverket, a, b, c, d, 2017). The observations consist of quarterly data over the period 1996:1-2015:4 giving the number of observations; n = 80 for the data set. The data set contains observations on the amount of hog produced in Sweden every quarter measured in tons, the market price of hog, the prices of wheat, barley and ryewheat that when collected was measured in sek/100kg. The data was collected into Microsoft excel and then converted into the unit tons and sek/ton.

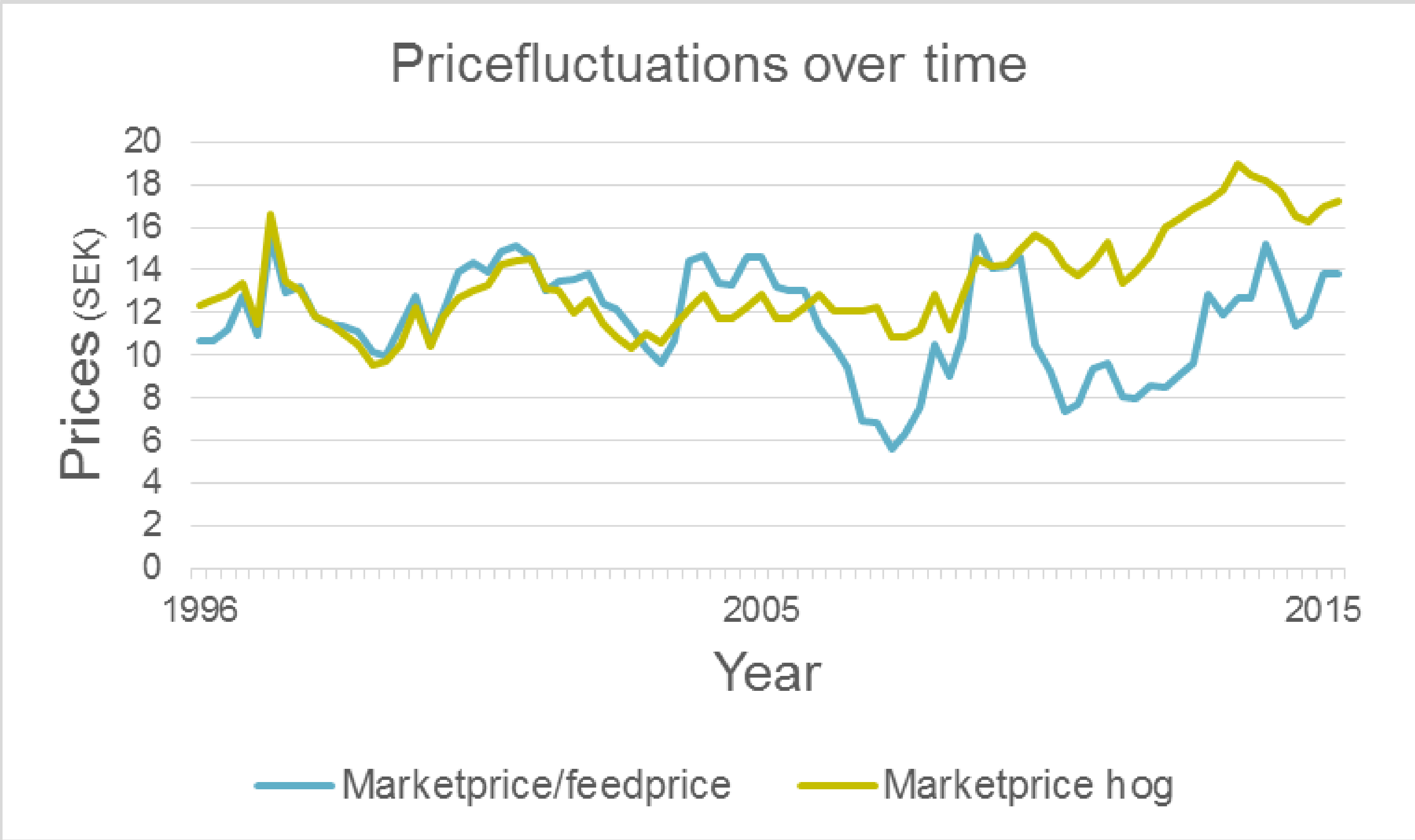
The prices of inputs, which are represented by the prices of wheat, ryewheat and barley were weighted equally to sum up to one variable. The formula used when weighting the variables is shown below in equation 11. These variables were weighted since one can expect farmer to switch inputs based on prices, and a weighted average should better represent an average price in each quarter (Moschini and Meilke, 1992).

$$P_{feed} = (P_{ryewheat} + P_{Wheat} + P_{Barley})/3 \qquad (11)$$

The highest variable cost in hog production is feed costs and it should be considered as a measurement of costs in the hog industry (Agriwise 2017). Swedish advisors on hog feed advise that about 80-85 of the hog feed should consist of grain about 8-15% of protein feed such as rapeseed and about 3-4% of premixes that contain certain amino acids[1]. As can be noted grain account for a large part of the feed and it should be a good measurement of costs.

Figure one on the next page shows the market prices of hogs and the ratio of market prices over / input prices. As can be noted in the time series plot it seems the data stays around roughly the same mean and that it tends to go back to the same mean value.

[1] E-mail. Kerstin Sigfridson. Advisor on pigs. Lantmännen. [2017-04-12]



Graph 1 Shows the price fluctuations over time. Source: Jordbruksverket

Graph 2 shows the aggregated supply over the last 20 years, unit thousands of tons Source: Jordbruksverket

Graph two on the previous page shows the total supply of hog meat on the Swedish market since 1996:1-2015:4. It can be noted in the graph that the hog market seems to be in a downward going trend with seasonality changes and short periods of stability. As explained in the previous section on econometric issues this could be the sign of non-stationarity. The stationarity of the dataset was established using the ADF test and the results of the test are shown below in table one.

Variable	Test	Lags	P-value
Ln(Qs)	ADF	8	0,05993
Ln(Po/pi)	ADF	8	0,007499

Table 1 shows the results of the stationarity tests

As seen in the ADF test the null hypothesis of a unit root could not be rejected at the five percent significance level, however on a ten percent level the null hypothesis could be rejected and the decision was made to assume stationarity. This choice was made due to the extent of this work and the timeframe of the survey.

4.4 Calculation of long run elasticity

The short run elasticities were received from the results of the regression of the empirical model. These elasticities were then used to calculate the long run elasticities. The formula used for this calculation was the one presented in equation 12, and is known as the long run multiplier (Nymoen, 2004).

$$LRe = ephog / (1- \beta_3 Qs_{t-1}) \qquad (12)$$

The long run elasticity, denoted LRe, is calculated using the proposed value of the own price elasticity. This is then divided by 1 subtracted with the coefficient of the lag dependent value. This is the long run multiplier and gives the long run elasticity. Ephog is the short run own price elasticity received from the estimated hog supply equation.

5 Results

In this chapter the results will be presented. First the empirical model is presented and the results are interpreted. Secondly the short and long run elasticities are presented.

5.1 Empirical results

The econometric results presented below in table 2 were estimated with AR(1), Cochrane-Orcutt regression using the software Gretl. The number of observations was n = 80 for each variable, due to autocorrelation the final numbers of observations run in the regression was n = 76.

Variable	Coefficient	Std. Error	P-value	Significance
Const	0.181	0.527	0.733	
$Ln(P_{i\ t-3} / P_{o\ t-3})$	0.0314	0.0172	0.073	*
dq2	0.080	0.022	0,0007	***
dq3	0.050	0.014	0,0008	***
dq4	0.092	0.022	<0.0001	***
RiskR	0.014	0.069	0.8359	
$LnQs_{t-1}$	0.947	0.036	<0.0001	***
R^2	0.84	Rho	− 0.17	
F	136			

***, ** and * denote significance at 1%, 5% and 10% level

Table 2 shows the empirical results from the regression

The result presented in table two has a rather high adjusted r-squared with a value of 0,84 which means it fits the data rather well. All the variables in the model are significant except the constant and the risk variable.

The expected signs on the regressors are as expected. The dummies shows a positive value for each dummy. The interpretation of this could be that the production of hog meat just after Christmas is a bit lower in the months January, February and March. The lag dependent variable, $LnQs_{t-1}$, has a rather high impact on the quantity supplied. The $Ln(P_{i\ t-3} / P_{o\ t-3})$ variable shows a positive and significant value. The expectations were fulfilled on this one since a raise in price should also raise the quantity supplied. The Risk variable does not show any significance. This variable was kept in the model for the reader to see the results. A model without the risk variable was run and this shows similar results as the model in table 2 this model can be found in appendix 1.

5.2 Long-run elasticity result

The long run own price elasticity was calculated using the long run multiplier presented in method chapter 4.4, and are presented in table three below.

Short run elasticity	0,0310182
Long run elasticity	0,589688409

Table 3 shows the short and long run elasticities

As expected the long run elasticity is rather higher than the short run elasticity. This is expected since in the long run the possibilities to change the technology exists, and producers can react to a change in prices better. The higher long run elasticity can be interpreted as that a shift in prices will show a greater impact on the market in the long run than in the short run.

6 Discussion

This section discusses the relevance and implications of the results. It compares the findings with previous research and proposes further research topics.

6.1 Results discussion

The results shown in the regression are as expected. The findings show a positive relationship between the price and the quantity supplied. It shows a rather small impact of the price and a greater impact of the quantity supplied. This implies that the market is slow adjusting and that it will take some time for the market to react to a change in prices (Rezitis and Stavropoulos, 2009). The implications of this slow adjusting market that only reacts a little bit to shifts in prices could be that it is capital intensive and that it takes time for the market to shift to a new capital level. Since this model did not include structural changes or changes in capital there is no way to tell if this is the case.

One important issue that could be discussed in further research is whether a policy intervention would be suitable to support the hog market. Since the findings in the research show that a raise in prices will raise supply a policy intervention might raise the supply. A policy intervention, that for example regulates prices, might cause losses in consumer surplus (Nicholson, 2005). It could raise the price of food on the domestic market and might not be helpful for the economy. The welfare losses of policy interventions can be rather high and it is important to consider these losses. Policies can be formed in such a way that they support the farmer for their higher costs, such as suggpengen (Teddestedt, 2017). This policy was formed due to higher animal welfare costs and helps the production compete with imports from countries with lower costs.

It is important to address the reliability of the results. Since the hypothesis of a unit root could not entirely be rejected, the possibility of spurious regression should be considered. This is a large weakness in the method. The more common way to act when there is a unit root is to run a cointegration test and to check whether the variables are cointegrated and if so complete the modelling with an error correction model (Guajarati, 2009). The timeframe in this paper was to short to complete a cointegration test and an error correction model. The knowledge is also above econometric knowledge on a bachelor level therefore the decision was made to continue even though the stationarity could not be established on a 5 % significance level. It should be noted that the stationarity was established on a 10 % level.

The non-significance of the risk variable could have to do with the developed risk model and weaknesses in this method. A more common approach to risk modelling is using GARCH. The timeframe in this paper was too short to develop a complete GARCH model, however it should be considered in future research that this is a more commonly used approach.

6.2 Comparison with other research

The elasticity found in this research is very inelastic with a value of 0,031 which is in line with prior research. Presented below in table 4 is prior estimates of elasticities of supply. The previously estimated elasticities are in the span between 0,042-0,205.

Prior estimates of hog supply elasticities		Period	Elasticity	Long run
Holt and Moschini (1992)	US	1958-1990	0,172	1,92
Rezitis and Stavropoulos (2009)	Greece	1993-2005	0,062	0,315
Rude and Surry (2015)	Canada	1988-2008	0,125-0,205	NA
In this paper		1996-2016	0,031	0,58

Table 4 Prior estimates of short and long run elasticities

The elasticities shown in the figure are from the Canadian, Greek and US market. The elasticity proposed in this essay, 0,031 is similar to the results discovered in previous research. The long run elasticity with a value of 0,58 is higher than the values proposed by Rezitis and Stavropoulos (2009) but lower than the values proposed by Holt and Moschini (1992). Long run elasticities were not calculated by Rude and Surry (2015) since their research did not include lagged dependent variable as a variable in the regression.

6.3 Further research

I believe this research could be extended to include more independent variables. More independent variables could give a deeper understanding of the hog supply function. The question to be answered was, *what is the price supply relationship on the Swedish aggregated hog market?* This could be expanded to not only include prices but other factors as well such as government policies or veterinary expenses.

Another approach could be to include the whole market. This paper only examined the price relationship for the finished pigs, it might be interesting to include the farrow farms as well. With more data on different parts of the market the results would get more credible. It could also be interesting to include policy evaluations in further research. In a research that includes the whole market the possibility to examine suggpengen that was described in the introduction also exists.

7 Conclusion

In this paper the Swedish hog market has been studied to find the relationship between hog supply and prices. Quarterly prices of input and output were included to find the effect of these. Three dummy variables were included as well to check for seasonality in the data.

The aim of this paper was to find short and long run elasticities of the Swedish hog market to answer the question:

What is the price supply relationship on the Swedish aggregated hog market?

The hypothesis was that there is a positive relationship between prices and supply. This hypothesis was based on previous research that has found a similar relationship. The elasticities found in the paper confirms the hypothesis. The results imply that a raise in prices would also raise supply. The long run elasticity is higher than the short run elasticity which could be since it is easier to adopt the technology to higher production levels in the long run.

The model in the paper did not include imports or exports which could be an important factor to consider in future research. By including imports in the model one might find another relationship between supply and prices. However my knowledge on how to build a complete supply model with such variables included is not sufficient. In such a model both demand and supply would have to be considered. One might have to differentiate between the market demand in order to find the real effects of shifts in prices.

With this said it is important to consider these findings as an important attempt to understand the Swedish hog market. The results should only be considered as partly explaining the relationship between supply and price. Further research with structural changes, veterinary expenses and imports included are proposed to find more credible results. The necessity of constructing a risk model that correctly accounts for the behavior of the farmers is also necessary to raise the credibility in future studies

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Appendix 1

Dependent variable: l_Slaktsvinkvantiteton1000					
rho = -0.457529					
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	0.178644	0.522883	0.3417	0.7336	
l_Marketpricefeedpriceton_3	0.0310182	0.0170069	1.8239	0.0724	*
dq2	0.0793713	0.0221881	3.5772	0.0006	***
dq3	0.0491623	0.0139071	3.535	0.0007	***
dq4	0.0922419	0.0220658	4.1803	<0.0001	***
l_Slaktsvinkvantiteton1000_1	0.947399	0.035352	26.799	<0.0001	***
Statistics based on the rho-differenced data:					
Mean dependent var	10.0395		S.D. dependent var	0.112821	
Sum squared resid	0.149529		S.E. of regression	0.046218	
R-squared	0.843368		Adjusted R-squared	0.83218	
F(5, 70)	164.7969		P-value(F)	2.79E-37	
rho	−0.174020		Durbin's h	−1.594696	