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by

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ABSTRACT

The price difference between farm and retail levels is called price spread, which is constituted mostly by marketing costs and profits. From the price spread, this paper intends to estimate elasticities of price transmission for pork in Malaysia via different empirical model specifications of markup pricing model. Using data from January 1997 to December 2007, a quantitative analysis of farm-to-retail price spreads was undertaken for pork in Malaysia. It was found that retail price is the only variable which is significant. The farm-retail price transmission for pork is very elastic.

Keywords: *Price spread, elasticity of price transmission, pork*

JEL code: Q11, Q13

1.0 INTRODUCTION

There has been a spate of changes precipitated by the frequent increase in retail price of pork despite a declining trend of per capita consumption of pork in Malaysia since late 1990's. Foremost amongst these are the doubling of feed, production, and marketing costs over the years. All these costs are embedded in the price changes of pork which are fully transmitted through the whole chain to the consumers. The declining trend of per capita consumption of pork is attributed mostly to disease, environmental, and health issues over the years in the country. The bulk of the new measures as well as stepping up of on-going efforts are directed at increasing food safety and environmental friendly pig production. All these are potential 'extra costs' in supply as well as price changes at retail level. The price difference between farm and retail levels is called price spread, which is constituted mostly by marketing costs and profits. From the price spread, this paper intends to estimate elasticities of price transmission for pork in Malaysia via different empirical model specifications of markup pricing model.

Markup pricing model has been notably applied in previous studies (Heien, 1980; Kinnucan and Forker, 1987; Ferris, 1998). However, Gardner (1975) and Wohlgenant and

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Mullen (1987) found the inferior performance of the markup pricing model compared to the relative price spread specification. This is because the farm-retail price spread changes when retail food demand, farm product supply, or the supply of marketing services shifts. Encountering such issues in policy applications, Wohlgenant and Mullen (1987) suggest a relative price model. The relative price model was compared with the markup pricing model in Dickerson (2003). As Dickerson (2003) intended to derive elasticity of price transmission, the better performance of the markup pricing model is consistent with the suggestion by Wohlgenant and Mullen (1987) that the markup pricing model is more plausible for deriving elasticities.

2.0 DATA AND METHOD

Monthly data from January 1997 to December 2007 for pork production, farm price, and retail price were collected from the Federation of Livestock Farmers' Associations of Malaysia (2009). Farm-retail price spread can be further seen as an aggregate of marketing costs and profits. Ferris (1998) suggests that the price spread is equal to the equilibrium of demand and supply of marketing services and materials per unit of product, where marginal value of the marketing services and materials per unit of product (addressed as marketing margin in this study) is equal to marginal cost. The marketing margin is in fact the price spread between farm and retail levels. By simplifying the equilibrium procedure, the markup pricing function can be expressed as:

$$MM = f(Q, P_r, C) \quad (1)$$

where MM = the price spread,
Q = the quantity of the agricultural commodity processed, and
P_r = the price of the retail product, and
C is a vector of marketing input prices (wage rates, transport costs, and others).

Using the function as a basis, the following empirical model specifications of markup pricing model are estimated via Ordinary Least Square:

$$MM_t = c + \beta_1 P_{rt} + \beta_2 FC_t + \beta_3 S1 + \beta_4 S2 + \beta_5 S3 \quad (2)$$

$$MM_t = c + \alpha_1 P_{rt} + \alpha_2 FC_t + \alpha_3 S1 + \alpha_4 S2 + \alpha_5 S3 + \alpha_6 Q_t \quad (3)$$

where MM_t = Retail price minus farm price in month t (Ringgit/kilogram),
P_{rt} = Retail Price in month t (Ringgit/kilogram),
FCt = Fuel Cost (Diesel) in month t (Ringgit/litre),
S1 = Season 1,
S2 = Season 2,
S3 = Season 3, and
Qt = Pork Production in month t (kilogram).

The results from Equations (2) and (3) are tested with Breusch-Godfrey test for serial correlation in the residuals. With the presence of serial correlation in the residuals of the equations, it will lead to incorrect estimates of the standard errors, and invalid statistical

inference for the coefficients of the equations. To handle this, Ferris (1998) suggests first order autoregressive error specification that can be expressed as:

$$MM_t = c + \varphi_1 P_{rt} + \varphi_2 FC_t + \varphi_3 S1 + \varphi_4 S2 + \varphi_5 S3 + \varphi_6 AR(1) \quad (4)$$

$$MM_t = c + \lambda_1 P_{rt} + \lambda_2 FC_t + \lambda_3 S1 + \lambda_4 S2 + \lambda_5 S3 + \lambda_6 Q_t + \lambda_7 AR(1) \quad (5)$$

where other variables are as described earlier and

$AR(1)$ = First order autoregressive error specification to correct for serial correlation in the residuals.

Based on its performance, parameters in a better model are used to yield elasticities of price transmission for pork. The formula for the elasticity of price transmission is:

$$EPT_t = \frac{1}{(1 - CRP)} * \frac{FP_t}{P_{rt}} \quad (6)$$

where CRP = Coefficient Associated with Retail Price,

FP_t = Farm Price in month t (Ringgit/kilogram), and

P_{rt} = Retail Price in month t (Ringgit/kilogram).

3.0 RESULTS

Table 1 presents the parameter estimates of initial specifications of markup pricing model. Without interpreting the parameter estimates, the attention is to look at the Durbin-Watson statistics. The low values of the Durbin-Watson statistics reported above are indicative of the presence of serial correlation in the residuals of the estimated equation. Thus, Breusch-Godfrey test were conducted for serial correlation in the residuals.

Table 1: Parameter estimates of initial specifications of markup pricing model

	Equation (2)		**Equation (3)**	
Variable	**Coefficient**	**(Std. Error)**	**Coefficient**	**(Std. Error)**
Constant	0.4742	(0.3586)	0.1799	(0.3885)
Retail Price	0.5457	(0.0348)***	0.5268	(0.0359)***
Quantity of Production	-	-	0.0000	(0.0000)*
Fuel Cost	-0.4523	(0.3139)	-0.4078	(0.3118)
Season 1	0.0481	(0.1389)	0.0445	(0.1376)
Season 2	-0.1588	(0.1388)	-0.1604	(0.1374)
Season 3	-0.1811	(0.1389)	-0.1783	(0.1376)
Durbin-Watson statistics	0.4684		0.5030	

The results of the test are reported in Table 2. The statistic labeled “Obs*R-squared” is the LM test statistic for the null hypothesis of no serial correlation. The (effectively) zero probability value strongly indicates the presence of serial correlation in the residuals in both models.

Table 2: Results of Breusch-Godfrey test

	Equation (2)	Equation (3)		Equation (2)	Equation (3)
F-statistic	197.3874	176.7524	Prob. F	0.0000	0.0000
Obs*R-squared	80.8193	77.5765	Prob. Chi-Square(1)	0.0000	0.0000

Relatively, first order autoregressive error specifications of markup pricing models were estimated. Table 3 presents the comparisons of performance for the markup models expressed in Equations (4) and (5) respectively. The slightly bigger R-square value of Equation (4) gave a first indication that the goodness of fit of Equation (4) is better than Equation (5). To reaffirm such indication, the best specification was chosen based on the lowest Schwarz and Akaike criteria. The markup pricing model of Equation (4) was determined to be the better model for pork.

Table 3: Comparisons for the markup models

	Equation (4)	Equation (5)
R-square	0.9156	0.9154
Akaike info criterion	0.5839	0.5961
Schwarz criterion	0.7375	0.7717

With the selection of Equation (4), the parameter estimates of first order autoregressive error specifications of markup pricing model are presented in Table 4. While most of the variables are not statistically significant, the coefficient of retail price indicates that retail price has a positive and statistically significant effect on marketing margin for pork.

Table 4: Parameter estimates of first order autoregressive error specifications of markup pricing model

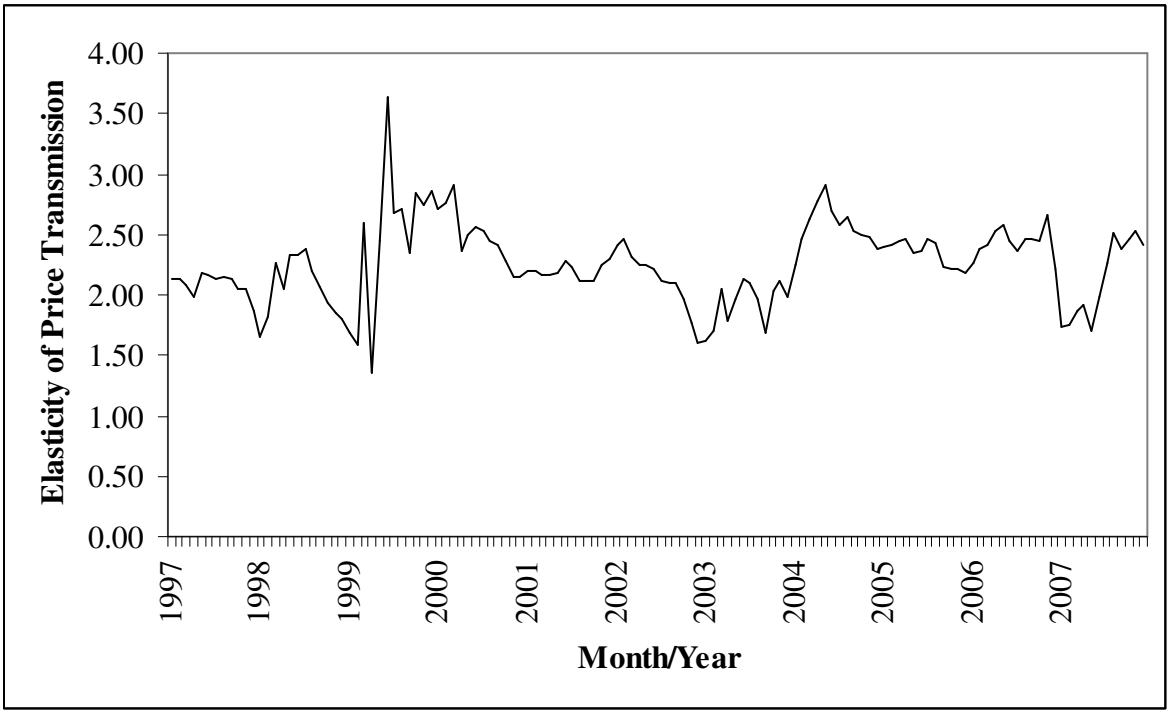
Variable	Coefficient	(Std. Error)
Constant	-0.9269	(1.1942)
Log(Retail price of pork)	0.7879	(0.0469)***
Log(Price of fuel)	-1.1796	(0.7969)
Season 1	0.0235	(0.0905)
Season 2	0.0758	(0.1021)
Season 3	0.0171	(0.0881)
AR(1)	0.8902	(0.0447)***

Figure 1 illustrates the changes of the elasticity of price transmission for pork over the years. It is obvious that the elasticities vary from month to month. This is because the ratio of the farm price to retail price varies from month to month. Hence, the elasticity of price transmission is defined as the percentage change in retail price due to a one percent change in farm price. For instance, the average elasticity of price transmission over the years (2.25) can be interpreted as one percent increase in farm price is likely to see 2.25 percent increase in retail price of pork.

Seemingly, the price transmission has been very elastic even at its lowest and highest levels at 1.35 and 3.64 in April and June 1999 respectively. The sudden change within this period is due to the Nipah outbreak that saw astonishing shift away from pork consumption

where retailers were forced to sell at as low as RM0.80/kg marketing margins in June 1999. After the recovery, the market has corrected itself to reward the retailers with commensurate marketing margins between RM4.50/kg and RM6.50/kg, regardless of increasing production costs which implies directly in the farm price of pork. Hence, the latter years see the elasticity of price transmission is within the range of 1.50-2.50.

Figure 1: Changes of the elasticity of price transmission for pork over the years



4.0 CONCLUSION

Using data from January 1997 to December 2007, a quantitative analysis of farm-to-retail price spreads was undertaken for pork in Malaysia. Based on the R-square and Akaike and Schwarz Information Criterion, a better first order autoregressive error specifications of markup pricing model was estimated. It was found that retail price is the only variable which is significant. Should data is available, future studies may want to incorporate other marketing costs (labor, packaging, advertising, and other costs) to build a better model. The farm-retail price transmission for pork is very elastic, which is consistent with the *priori* observation where there has been frequent increase in retail price of pork despite a declining trend of per capita consumption of pork in Malaysia. This also tells that the consumers have no choice but to consume expensive pork or they seek for substitutes or they simply give up consuming pork. When having this in sight, it is a business opportunity for those who can offer cheaper pork to the country.

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