A managerial economist's forecast for meat consumption in Malaysia: Implications to farmers and investors

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A MANAGERIAL ECONOMIST'S FORECAST FOR MEAT CONSUMPTION IN MALAYSIA: IMPLICATIONS TO FARMERS AND INVESTORS

by

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ABSTRACT

In this consumer driven chain, the changes in meat consumption at consumer level indeed provide implication for upstream production. While econometrics based analysis and forecast are hard to be understood and digested by farmers or investors, a simple forecast from the perspectives of managerial economics as laid down in the objective of this study perhaps provide valuable insights on the future movement of meat consumption and demand. By using simple forecasting technique using mathematical model, farmers and investors can expect that poultry is to be continuing its vital role as the main source for meat in the country. This is to be coupled with increasing consumption in beef and mutton. However, it is likely the decreasing trend in pork is to be continued. Alternative pig farming system is identically the main concern in promising consumers food safety, freedom of disease, and a way of reclaiming the joy of eating by growing pig that is environmentally sustainable and socially responsible. The challenge is certain, extra efforts must be contributed to reduce the cost of supply chain amid of the increasing retail price of pork that drives consumers away to seek for cheaper substitution.

Keywords: *Meat, consumption, managerial economics*

JEL code: Q11, Q13

1.0 INTRODUCTION

Malaysian meat sector is dynamic in lieu with different religion settings that influence the consumption and production of major meat products in the country. Amongst the meat products, only poultry and mutton appear to be homogeneous to all religions and ethnics. While the production cycle time for mutton is lengthy, poultry production is indeed more lucrative under the industrialized production system that produces more than self-sufficient availability. The poultry segment has been intensified and rationalized, from the feed to the farm to the wholesale and retail channels, as an integration of one efficient supply chain. Relatively, poultry is the cheapest meat product. These illustrate well that poultry has been in the lead of popularity and consumption compared to other meat products.

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Other alternative meat products – pork and beef are consumed by non-Muslims and non-Buddhists respectively. There has been unpromising trend in pork consumption. Many factors contributed to these changes. To name a few, price effect, disease, contamination issues perhaps have driven consumer confidence level towards pork safety to the bottom ever in the century. If it is so, it is possible that beef consumption to overtake pork consumption in near future. Statistically, per capita consumption of pork has decreased from its peak at 10.73kg in 1980 to 7.35kg in 2006; per capita consumption of beef has stroked from 1.79kg to 6.42kg within the same period.

In this consumer driven chain, the changes in meat consumption at consumer level indeed provide implication for upstream production. Farming business is indeed, at the end of the day, constrained by the market demand. While econometrics based analysis and forecast are hard to be understood and digested by farmers or investors, a simple forecast from the perspectives of managerial economics as laid down in the objective of this study perhaps provide valuable insights on the future movement of meat consumption and demand.

2.0 DATA AND METHOS

Time series data of beef, pork, mutton, and pork consumption from 1960 to 2008 were collected from various issues of Agriculture Statistical Handbook (1960-2008). Many socio-economic factors shape the future meat consumption but it is difficult to include them all to have a good projection. Previous studies in Malaysia (Baharumshah and Mohamed, 1993; Hussein *et al*., 1986) used econometric based baseline projection for meat consumption. Table 1 presents the comparison between the forecasted values (extracted from Baharumshah and Mohamed, 1993) and actual observations. The deterministic forecast was overestimated, as they fall apart with actual observation over the years.

Table 1. Projection of per capita meat consumption (kg)

Year	Beef		Poultry		Mutton		Pork	
	Forecast[i]	Actual[ii]	Forecast[i]	Actual[ii]	Forecast[i]	Actual[ii]	Forecast[i]	Actual[ii]
1990	4.16	3.49	22.98	20.31	3.02	0.49	39.81	10.29
1995	4.4	4.67	30.99	33.06	3.95	0.66	52.33	10.42
2000	4.71	5.50	42.99	30.0	5.2	0.75	69.06	7.67
RMSE	**0.53**		**6.13**		**3.42**		**44.52**	

Sources: [i]Baharumshah and Mohamed (1993); [ii] Agriculture Statistical Handbook (1960-2008)

Accuracy (deterministic) of forecast does not serve a certain purpose but rather just acts as indicator of future movement. Thus, stochastic forecast is to be used in this study to allow the forecast falls within a range, which indeed can provide a better indication for future movement. This technique can be done through an estimation of simple mathematical model for *i*th meat product by using managerial economics method. The simple mathematical model can be expressed as:

$$Q_i = \beta_{0i} + \beta_{1i} TT$$

where Q is consumption (quantity) of ith meat product and TT is time trend in the data series. The forecast can then be done by plugging the continuous time trend up to 2020 into the estimated linear regression. Stochastically, the projection is shifted upward and downward based on the average percentage of residuals in the observations.

3.0 RESULTS

The empirical results of the analyses are exhibited in Table 3. The time trend is found to be positively related to meat consumption across time periods. It means meat consumption generally grows as time passes by. For example, a year difference is likely to see beef consumption to grow by 0.13kg while other things remain unchanged.

By examining the difference between the observed (actual) meat consumption and the forecasted meat consumption, root mean square error (RMSE) was determined to measure the accuracy or reliability of the forecasting technique using the mathematical model. The smaller the value of RMSE, the greater the accuracy of the forecasting model. It is apparent that the performance of forecasting model for mutton and beef are much better than pork and poultry.

Table 2. Estimated parameters of the mathematical model

	Beef Coefficients (Std. error)	**Poultry** Coefficients (Std. error)	**Mutton** Coefficients (Std. error)	**Pork** Coefficients (Std. error)
Intercept	0.80	3.35	0.31	9.08
	(0.15)***	(0.95)***	(0.03)***	(0.53)***
Time trend	0.13	0.87	0.01	-0.0024
	(0.01)***	(0.04)***	(0.00)***	(0.02)***
RMSE	**0.45**	**2.83**	**0.09**	**1.57**

Note: *** Statistically significant at 1% level of significance.

Regardless of the performance of the forecasting models, by plugging continuous time trend values into the parameters, an initial projection for the major products was obtained.

Table 3. Projection of per capita meat consumption (kg)

Year	**Beef**	**Poultry**	**Mutton**	**Pork**
2009	6.03	38.04	0.76	8.98
2010	6.16	38.90	0.77	8.98
2011	6.29	39.77	0.78	8.98
2012	6.42	40.64	0.79	8.97
2013	6.55	41.51	0.81	8.97
2014	6.68	42.37	0.82	8.97
2015	6.81	43.24	0.83	8.97
2016	6.94	44.11	0.84	8.96
2017	7.08	44.97	0.85	8.96
2018	7.21	45.84	0.86	8.96

2019	7.34	46.71	0.87	8.96
2020	7.47	47.58	0.88	8.96

In order to make it to be stochastic, projected beef, poultry, mutton, and pork consumption was adjusted by 5 percent (as indicated by the average residual). The stochastic projection of meat consumption is depicted in Table 4. The range of the projected consumption values is to indicate that the future consumption is likely to happen within the range, which tolerates reduction and increase in the future. Overall, all meat consumption is projected to increase. Most strikingly is the poultry consumption which is expected to grow at a faster pace and followed by beef consumption which is anticipated to overtake pork consumption in future. Still, mutton consumption is projected to remain low.

Table 4. Stochastic projection of per capita meat consumption (kg)

	Beef		**Poultry**		**Mutton**		**Pork**	
Year	Low variant	High variant	Low variant	High variant	Low variant	High variant	Low variant	High variant
2009	5.73	6.33	36.14	39.94	0.72	0.80	8.53	9.43
2010	5.85	6.47	36.96	40.85	0.73	0.81	8.53	9.43
2011	5.98	6.60	37.78	41.76	0.74	0.82	8.53	9.43
2012	6.10	6.74	38.61	42.67	0.75	0.83	8.52	9.42
2013	6.22	6.88	39.43	43.59	0.77	0.85	8.52	9.42
2014	6.35	7.01	40.25	44.49	0.78	0.86	8.52	9.42
2015	6.47	7.15	41.08	45.40	0.79	0.87	8.52	9.42
2016	6.59	7.29	41.90	46.32	0.80	0.88	8.51	9.41
2017	6.73	7.43	42.72	47.22	0.81	0.89	8.51	9.41
2018	6.85	7.57	43.55	48.13	0.82	0.90	8.51	9.41
2019	6.97	7.71	44.37	49.05	0.83	0.91	8.51	9.41
2020	7.10	7.84	45.20	49.96	0.84	0.92	8.51	9.41

4.0 CONCLUSIONS

By using simple forecasting technique using mathematical model, farmers and investors can expect that poultry is to be continuing its vital role as the main source for meat in the country. This is to be coupled with increasing consumption in beef and mutton. However, it is likely the decreasing trend in pork is to be continued. Having this scenario, pig farmers and investors perhaps would like to seek for alternatives to pig farming system or shift away from pork business. Alternative pig farming system is identically the main concern in promising consumers food safety, freedom of disease, and a way of reclaiming the joy of eating by growing pig that is environmentally sustainable and socially responsible. However, the responsibility to ensure food safety is not just on farmers solely, other market players along the supply chain are also liable to deliver pork without disease. The challenge is certain, extra efforts must be contributed to reduce the cost of

supply chain amid of the increasing retail price of pork that drives consumers away to seek for cheaper substitution.

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