

Determinants of Muslim Household Basic Needs Consumption Expenditures

(Penentu Perbelanjaan Penggunaan Keperluan Asas Isi Rumah Muslim)

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ABSTRACT

This paper focuses on current household expenditure in an environment characterised by a high cost of living and modernisation. In order to cope with the current economic situation, individual vary in their consumption levels and lifestyles. In this study, basic needs expenditure refers to four main groups of household expenditure, namely food, housing, transportation and communication given that they make up a significant part of total household expenditure. Furthermore, the different budget constraints that vary with income and location, the different expenditure patterns reflect how people are surviving in the current economic climate. This paper identifies the factors contributing to basic needs consumption comprising food, housing, transportation and communication. The econometric analysis using Seemingly Unrelated Regression Estimation (SURE) shows that these expenditures are largely determined by the total monthly spouse income (Inc) and total borrowing (Bor) for all consumption expenditures. The results with interaction term also revealed no difference in the basic needs expenditure of urban and rural households in Selangor and Kelantan. Based on the findings, households should be educated on consumerism and financial management for effective financial planning.

Keywords: Household Consumption Expenditure (HCE); Seemingly Unrelated Regression Estimation (SURE); Basic needs consumption expenditure; muslim households

ABSTRAK

Artikel ini memberi penekanan terhadap perbelanjaan isi rumah semasa dalam persekitaran kos sara hidup yang tinggi dan arus pemodenan. Bagi menangani keadaan ekonomi semasa, setiap individu mempunyai tahap penggunaan dan gaya hidup yang berbeza. Dalam kajian ini, perbelanjaan keperluan asas merujuk kepada empat kumpulan utama perbelanjaan isi rumah, iaitu makanan, perumahan, pengangkutan dan komunikasi kerana perbelanjaan tersebut memberi kesan terhadap jumlah perbelanjaan isi rumah. Selain itu, kekangan belanjawan yang berbeza mengikut pendapatan dan lokasi, memberikan corak perbelanjaan yang berbeza dalam menggambarkan bagaimana seseorang itu dapat meneruskan kehidupan mereka berdasarkan situasi ekonomi semasa. Artikel ini mengenal pasti faktor-faktor yang menyumbang kepada penggunaan keperluan asas seperti makanan, perumahan, pengangkutan dan komunikasi. Analisis ekonometrik dengan menggunakan 'Penganggar Regresi Tidak Berkaitan' (SURE) menunjukkan bahawa perbelanjaan ini sebahagian besarnya ditentukan oleh jumlah pendapatan pasangan bulanan (Inc) dan jumlah pinjaman (Bor) untuk kesemua perbelanjaan penggunaan. Dapatan 'terma interaksi' (negeri dan lokasi) menunjukkan bahawa tiadanya perbezaan dalam perbelanjaan keperluan asas di bandar dan luar bandar bagi negeri Selangor dan Kelantan. Berdasarkan penemuan tersebut, isi rumah seharusnya diberikan pendidikan kepenggunaan dan pengurusan kewangan bagi mencapai perancangan kewangan berkesan.

Kata kunci: Perbelanjaan Penggunaan Isi Rumah (HCE); Penganggar Regresi Tidak Berkaitan (SURE), perbelanjaan penggunaan keperluan asas; isi rumah muslim

INTRODUCTION

Current consumption levels and lifestyle patterns in Malaysian have changed due to significant transformations

in its economic system as a result of modernisation, urbanisation, globalisation, trade liberalisation and economic growth. Furthermore, materialism has permeated into the soul of every community through



easy access to a broad selection of goods and services (Basri 2003). Similarly, a rise in salary, lifestyle changes, economic boom and rapid development accelerate consumption growth (Sharifah et al. 2005).

According to Yaty Sulaiman et al. (2014), the Malaysian consumer consumption pattern has changed significantly since 2005 through several indicators such as the Consumer Price Index (CPI), per capita income and inflation rate. The increase in consumer price index (CPI) from 95.4% in 2000 to 122.8% in 2013 indicates that consumers have to pay higher prices for consumer goods due to rising commodity prices such as oil palm, rubber and fuel prices. In 2005, per capita income for Malaysia was USD 5372 and increased gradually to 26 percent to USD 6765. It means that Malaysians need to increase their work intensity by 121 percent to reach the 2020 target of USD 15,000 per capita income. The most important component of GDP is household consumption. Household consumption patterns indicate consumption decisions, changes in consumer behaviour and income, asset holdings and personal circumstances at the macro and micro levels (Pistaferrri 2006). Economic resources and household expectations about future resources are significant in the macroeconomic perspective due to consumers responding to tax and welfare policy reforms. At the micro level, the level and composition of one's net worth can be influenced by household consumption patterns.

Before proceeding, it is useful to have a clear understanding of the concept of 'Household Consumption Expenditure' (HCE) in order to portray the circumstances in household financial management based on income and expenditure. HCE can be defined as the 'value of consumer goods and services acquired, used or paid by a household through direct monetary purchase, own account production, barter or as income in kind for the satisfaction of the needs and wants of its members' (Department of Statistic 2016). HCE in Malaysia will detail the household expenditure according to 12 main groups such as food & non-alcoholic beverages; alcoholic beverages & tobacco; clothing & footwear; housing, water, electricity, gas & other fuels; furnishings, household equipment & routine household maintenance; health; transport; communication; recreation services & culture; education; restaurants & hotels; miscellaneous goods & services.

For the purposes of this research, basic needs in this study refer to the category of expenditures which allocate a significant amount of money from household income to cover the expenses of household members. Besides, it is also defined as family budget by Allegretto (2006) to explain the ability of families to survive their basic needs with current income level. On the other hand, basic needs can be similar to the term of 'minimum expenditure' which explain the expenditure needed with limited income to achieve their utility maximization (Nicholson & Synder 2008). According to the Overseas Development

Institute (1978), there is no single universally accepted definition of 'basic needs', and there is no uniform vocabulary to describe its various elements. Economic facts revealed that low-income households would allocate a large portion of their income for 'basic need' expenditure rather than unnecessary expenses. Maslow's theory encompasses the needs of self-perfection, the need for self-respect, love and social needs, security needs, and physiological needs. It shows that in terms of human psychology, everyone will ensure the lowest level of requirements are met before trying to meet the needs of a higher level (Maslow 1971).

Based on recent household surveys in Malaysia, the average monthly expenditure jumped 88.6% from RM1161 in 1993/94 to RM2190 in 2009/10. Although Malaysia's national household survey is conducted four times every five years, starting 1993/93, 1998/99, 2004/05 and 2009/10, the data obtained does not take into account the time series data and the current economic situation. On average, urban households spend 1.5 times more than rural households with average monthly consumption expenditure of RM2465 per month (city) as compared to RM1599 (rural) for 2009/10. In this survey, consumption expenditure refers to all expenses for personal use of goods and services throughout the reference period. In urban areas, primary expenditure comprises housing, water, electricity, gas and other fuels with 23.7% while rural areas are non-alcoholic and non-alcoholic beverages with 27.4% (Department of Statistics Malaysia 2011). Nearly 70% of household expenditure is allocated to four main groups, namely housing, water, electricity, gas and other fuels by RM495 or 22.6%, non-alcoholic food and beverages of RM444 or 20.3%, transport with RM327 or 14.9% and restaurants and hotels with RM239 or 10.9%.

The yearly growth rate for household consumption expenditure for the period from 1993 to 2014 was 5.4 percent which increased from RM1,161 to RM3,578. In that period, expenditure on food & non-alcoholic beverages and furnishings, household equipment & routine household maintenance declined. Meanwhile, housing, water, electricity, gas & other fuels and communication increased. The 2016 household survey report found that the mean monthly consumption expenditure increased by 5.4% yearly over a period of 23 years. The findings showed that consumption expenditure for food & non-alcoholic beverages declined to 18.0 percent in 2016 from 23.8 percent in 1993. Meanwhile, consumption expenditure for education, recreation services & culture, and restaurants & hotels increased to 1.3 percent, 5.0 percent and 13.4 percent respectively. The report noted significant differences between the household income groups of the Top 20% (T20), Middle 40% (M40) and Bottom 40% (B40) in consumption expenditure patterns. The T20 income group allocated most of its consumption expenditure on transport. While M40 concentrated on restaurants & hotels, while B40 focused on housing, water, electricity, gas and other fuels, food and non-

TABLE 1. Percentage of Mean Monthly Household Consumption Expenditure by Goods and Services, Malaysia

Main Group of Household Consumption Expenditure	1993/94	1998/99	2004/05	2009/10	2014/15	2016/17
Food and Non-Alcoholic Beverages	276(23.8%)	368(22.6%)	393(20.1%)	444 (20.3%)	676 (18.9%)	726(18.0%)
Alcoholic beverages & tobacco	26 (2.2%)	30(1.9%)	35(1.8%)	48 (2.2%)	83 (2.3%)	98(2.4%)
Clothing & footwear	41(3.6%)	56(3.4%)	59(3.0%)	75 (3.4%)	124 (3.5%)	136(3.4%)
Housing, Water, Electricity, Gas & Other Fuels	245(21.1%)	363(22.2%)	430(22.0%)	495 (22.6%)	853 (23.9%)	969(24.0%)
Furnishings, household equipment & routine household maintenance	65(5.6%)	84(5.1%)	83(4.3%)	89 (4.1%)	137 (3.8%)	168(4.2%)
Health	21(1.8%)	29(1.8%)	27(1.4%)	29 (1.3%)	59 (1.6%)	75(1.9%)
Transport	168(14.5%)	227(13.9%)	314(16.1%)	327 (14.9%)	523 (14.6%)	553(13.7%)
Communication	24(2.1%)	59(3.6%)	103(5.3%)	124 (5.6%)	189 (5.3%)	203(5.0%)
Recreation services & culture	53(2.1%)	70(4.3%)	92(4.7%)	101 (4.6%)	174 (4.9%)	200(5.0%)
Education	17(4.6%)	31(1.9%)	38(2.0%)	31 (1.4%)	RM41 (1.1%)	54(1.3%)
Restaurants and Hotels	145(12.5%)	209(12.8%)	213(10.9%)	239 (10.9%)	454 (12.7%)	540(13.4%)
Miscellaneous goods & services	78(6.7%)	105(6.5%)	167(8.5%)	190 (8.7%)	266 (7.4%)	312(7.7%)
TOTAL	1161	1631	1953	2190	3578	4033

Sources: Department of Statistics, 2016

alcoholic beverages (Department of Statistics Malaysia 2011). Table 1 provides the percentages of mean monthly household consumption expenditure by goods and services from the year 1993/94 until 2016/17.

This paper examines four principal household expenditures to explain the survivability and livelihood of Malaysian families. It focuses on Muslim household and four main groups of basic needs consumption as suggested by Department of Statistic, 2016. These basic needs expenditure refers to four main groups of household expenditure, namely food, housing, transportation and communication given that they make up a significant part of total household expenditure.

Household consumption patterns portray the circumstances of household expenses on goods and services in the economic as mentioned in above. The global subprime crisis that took place in the United States had a significant impact on increasing debt and managing household expenses. What's more, it involved credit issues to reduce the risk of losses among banks and financial institutions. The event spread to several European countries such as Iceland, United Kingdom, Spain, Japan, New Zealand and also Australia (Zainal Abidin & Mohd Shukri 2009). In addition, the situation contributes to the indebtedness factor of the household. This is followed by other influences that also increase household indebtedness as real wages, interest rates, inflation and unemployment. This argument is supported

by Barba and Pivetti (2008) and Dromer et al. (2009). The widespread practice of *riba* followed by a 'hedonic' culture has had a negative impact on the value of a society, especially in terms of Islamic ideology and *aqidah*. The Islamic perspective on consumption differs from materialism which has become an aim in life (Amin et al. 2009; Lada et al. 2009; Md Taib et al. 2009). As the Islamic economic system differs from conventional economics, the laws, regulations, values and ethics related to economic activity are also different. Conventional economics is based on the philosophy of human thought whereas the Islamic economy is based on the teachings of the Quran and al-Sunnah. This means that all norms and ethics concerning expenditure need to be based on all the laws governed by Islamic teachings rather than mere desires.

On the other hand, Shamsuddin (2007) reported that the household debts increased due to the credit facilities such as personal loans, education, housing, credit cards and so on. In addition, households have a broad selection of goods and services. Consumption has also increased due to increased incomes and rapid development. Mismanagement of income and expenditure will lead to instability in a family's financials. Households should plan and prioritise their basic needs according to their income and budget constraints. Andreas and Alessio (2010) point out that Engel's curves can explain how households spend on goods and services based on

their income. The Engel curve changes the quantity demanded in goods and services as a result of changes in one's income level. It relates the household budget allocated to specific types of goods to total household expenditure. It provides, among other things, a framework to test 'Engel's law' that poorer households devote a higher share of total expenditure to food (Adriana & Barry 2007).

There is a lack of research assessing household spending patterns. The question is to what extent does consumer spending today accord to the Islamic teaching is to spend moderately according to the priorities of *daruriyyat* (basic), *hajiyyat* (requirement) and *tahsiniyyat* (complimentary)? To what extent is the practice of spending related to the principle of the *Maqasid Syariat* in protecting religion, life, intellect, wealth and offspring?

LITERATURE REVIEW

Prudent spending is sometimes misleading when a variety of goods and services is available in the market. Without applying smart management of income and consumption expenditure, the households will be easily stuck with high debt problems. Unfortunately, households are overconsuming to satisfy their needs and wants with budget constraint and limited income. Malaysian households spend about 57.4 percent on food, transport and housing. The B40 income group spends 62.6 percent of their total expenditure. Meanwhile, the M40 income group spends about 57 percent of their total expenditure and T20 spend about 54.4 percent. This finding shows that the B40 group spends almost two-thirds of its total expenditure on food and non-alcoholic beverages, housing, water, electricity, gas and other fuels and transport (Household Expenditure Survey 2014).

Research has explored basic needs expenditure at macro and micro levels to capture the significant impact of consumption expenditure on the quality of life among the households. In the real world today, it is unrealistic if the indicators used only look at basic needs without taking into account other factors such as increment in prices of goods, cost of living, economic fluctuations and so on. In addition, consumerism and 'Epicureanism' in the current economy play a significant role in shaping conventional consumption patterns. Epicureanism explains the hedonic lifestyle, with the goal to achieve conscious enjoyment of life (Farzana et al. 2015). Furthermore, conventional theories view materialism and hedonism as the aim of life (Amin. H et al. 2009; Lada.S et al. 2009; Md Taib, Fauziah 2009), which is contrary to the Islamic perspective of consumption and consumerism.

Food consumption expenditure is considered the largest expenditure in a household budget. The theory of consumption explains that the household will decide to choose those goods and services that will provide satisfaction (utility). These levels of satisfaction differ

depending on the extent to which the individual assesses the purchase in view of the financial constraints (Pindyck & Rubinfeld 2005). The lower the income level, the less the ability of households to spend on luxury foods. Ni Lar et al. (2011) found that food expenditure will increase if the head of the household is an older person. With the increase in the level of education, there is an increase of RM0.10 in food expenditure (Noorhaslinda 2016). With increasing household dependency, there was an increase of RM0.15 in food expenditure (Wook et al. 2007). However, in the midst of a contracting economy through the introduction of the Goods and Services Tax (GST) and the rise in the prices of goods, it affects household food expenditure regardless of whether they are poor, moderate or rich.

Housing needs are strongly related to housing expenditure as every household is sure to have a home or rent. Norazmawati (2007) found that many variables such as income, education level and housing loan debt influence low-cost housing ownership. This ability can be translated into household spending. Both are interconnected as the total housing expenses will affect home ownership (Rosadah & Khadijah 2002). Expenditures that often increase and decrease in fuel prices can be synonymous with transportation expenses (Laily & Nurizan 2004; Noorhaslinda 2016). An increase in education levels will contribute to RM0.22 in transportation expenses. Education level is identified as a significant factor in transportation expenses (Laily & Lokman 2005). Ni Lar et al. (2011) found that transportation expenditures had a positive impact on the number of years of study and employment in the transport sector, and a negative effect on the head of household's age as well as regular work.

Similarly, an increase in one's liability (dependency) leads to an increase in transportation expenses. On the other hand, the findings of Manchester (1977) in Laily and Nurizan (2004) found that the presence of children as dependents was negatively correlated to transportation expenses. Increased loan debt will increase transportation expenses. In terms of gender, a male head of household (HH) tends to spend more on transportation compared to women. Men are said to be more interested in vehicle accessories than women. In addition, urban households travelled more than rural households. In terms of state, those who live in Selangor have lower transportation expenses compared to Kelantan. This is supported by Manchester (1977) stating that the region (location) factor affects transport expenses.

An increase in age by one year will contribute to a reduction in communication expenses. Census results conducted on older respondents indicate that most communicate less than the youth such as using cell phones, internet, Astro and so on to connect with each other. While, in terms of dependency, an increase in one of the family members led to an increase in communication spending. Moreover, increasing income and debts will result in an increase in communication expenses. For

education, when there is a one-year increase in the year of study, it will result in an increase of RM0.26 in total communication expenses (Laily & Lokman 2005; Noorhaslinda 2016).

MUSLIM HOUSEHOLDS CONSUMPTION PATTERN

Studies on the influence of religion in shaping the behaviour of consumers are limited, especially in regards to the religion of Islam (Hamza Salim Lutfi Khraim 2000). Only five theses in Malaysia have been dedicated to this issue (Ahmad Azrin 2010). According to Hirschman (1983), three factors explain why religion is not the main focus among the researchers. The first factor is that advertisers are unaware of the relationship between religion and spending patterns. Secondly, the study of religion in terms of consumption is said to be prohibited. Third, religion has a declining role in a person’s life.

Religion is a significant factor in influencing consumer behaviour along with culture. Syed Shah Alam et al. (2011) stated that individuals can be categorised into four subcultural groups, namely nationality groups, religious groups, racial groups and geographical regions. In these groups, religion is one of the most influential determinants of human behaviour. Mokhlis (2009) found that religion is a significant factor and the most influential social institution in shaping people’s attitudes, value and behaviours from the individual and societal perspectives. In addition, Kotler (2000) claimed that people who have religion prioritise certain values that influence their actions and decisions.

Based on this argument, this researcher explores the extent to which the religious factor shapes Muslims’ consumption expenditure. Since the measurement in this study is based on the aspects of aqidah, tauhid and Islamic consumerism, it is appropriate to implemented among Muslim households. The comparison between Muslim households in Selangor and Kelantan will help achieve the research objective.

METHODOLOGY

This study applies stratified random sampling with 441 respondents (Muslim households) in Kelantan and

Selangor (the highest per capita of GDP) and Kelantan (the lowest per capita of GDP) as recorded by the Department of Statistic (2013). According to the Tenth Malaysia Plan (2011-2015), average household income in Malaysia was RM4,025 in 2009 compared to RM3,249 in 2004. Kelantan and Selangor recorded the most significant difference in average household income with their income being RM2,536 and RM5,962 in 2009 (Department of Statistics Malaysia 2010). Similarly, the difference in income inequality between states in 2009 occurred in both states to represent the highest and lowest gaps. These measurements can illustrate the prevailing circumstances in Malaysia where the income disparity ratio between these significant populations will create a socioeconomic disparity problem especially for the most developed state (Selangor) with the least developed state (Kelantan). This will ultimately provide a heavy burden to the lower income group than the higher income group. They will soon experience the economic crisis that can be seen in terms of rising oil prices, rising prices of goods and so on. Therefore, for this reason, the sample selection was taken from the state of Selangor as representing the advanced areas while Kelantan represented the least developed area with the scope of the area for both states concentrating on urban and rural areas.

Due to the budget constraint, Petaling and Sabak Bernam districts were selected to represent urban and rural areas in Selangor. Meanwhile, Kota Bharu and Jeli represent urban and rural areas in Kelantan respectively. The selection of this study area is based on data released by the Department of Statistics, Malaysia 2010 as well as the results of suggestions and interviews conducted with the Chief of District Officer for both states. Both samples were based on the total number of households in Selangor at 1,375,869 while for Kelantan was 300,178 persons (Department of Statistics Malaysia 2010). Therefore, Table 2 presents the sample distribution of respondent by districts based on Krejcie and Morgan (1970).

$$\text{Number of Sample} = \frac{\text{number of population in each area}}{596258} \times 500$$

The selected of 441 respondents are sufficient to represent the population because our study population is 596,2587 people that is greater than 100,000 people. Based on Krejcie and Morgan (1970), the sample size

TABLE 2. Sample distribution

State	District	Population	Proposed Sample	Actual Sample
Kelantan	Kota Bharu (Urban)	466,862	391	75
	Jeli (Rural)	24,800	21	10
Selangor	Petaling Jaya (Urban)	96,278	81	336
	Sabak Bernam (Rural)	8318	7	20
Total		596,2587	500	441

for 100,000 people is supposed to be selected maximum at 384 respondents. So our sample has been fulfilled the condition of Krejcie and Morgan (1970), which is greater 441 respondents than 384 respondents. Then, the selected respondents are categorised into three group of income level which are T20, M40 and B40. The secondary data is also referred to support the findings based on Household Expenditure Survey (HES), Malaysia, which covers the urban and rural strata for all states. The household consumption expenditure pattern was analysed and presented at national, state and strata level consist of household expenditure patterns and composition, together with the median and mean monthly household expenditure.

MODEL SPECIFICATION

Due to previous studies, the above mentioned explanatory variables were used to measure the consumption of food, housing, communication and transportation. Thus, four models are developed as follows:

For food consumption,

$$CF_i = \alpha_0 + \alpha_1 Inc_i + \alpha_2 Sav_i + \alpha_3 Bor_i + \alpha_4 Dep_i + \alpha_5 Edu_i + \alpha_6 MS_i + \alpha_7 Gen_i + \alpha_8 Age_i + \alpha_9 Eco_i + \alpha_{10} Sta_i + \alpha_{11} Loc_i + \alpha_{12} StaLoc_i + \varepsilon_f \quad (1)$$

For housing consumption,

$$CH_i = \beta_0 + \beta_1 Inc_i + \beta_2 Sav_i + \beta_3 Bor_i + \beta_4 Dep_i + \beta_5 Edu_i + \beta_6 MS_i + \beta_7 Gen_i + \beta_8 Age_i + \beta_9 Eco_i + \beta_{10} Sta_i + \beta_{11} Loc_i + \beta_{12} StaLoc_i + \varepsilon_h \quad (2)$$

For communication consumption,

$$CC_i = \gamma_0 + \gamma_1 Inc_i + \gamma_2 Sav_i + \gamma_3 Bor_i + \gamma_4 Dep_i + \gamma_5 Edu_i + \gamma_6 MS_i + \gamma_7 Gen_i + \gamma_8 Age_i + \gamma_9 Eco_i + \gamma_{10} Sta_i + \gamma_{11} Loc_i + \gamma_{12} StaLoc_i + \varepsilon_c \quad (3)$$

For transportation consumption,

$$CT = \delta_0 + \delta_1 Inc_i + \delta_2 Sav_i + \delta_3 Bor_i + \delta_4 Dep_i + \delta_5 Edu_i + \delta_6 MS_i + \delta_7 Gen_i + \delta_8 Age_i + \delta_9 Eco_i + \delta_{10} Sta_i + \delta_{11} Loc_i + \delta_{12} StaLoc_i + \varepsilon_t \quad (4)$$

Which are denotes as total of monthly spouse income (RM), *Sav* = monthly saving (RM), *Bor* = total of borrowing (RM), *Dep* = number of dependent, *Edu* = number of year of study experience, *MS* = marital status, dummy *Gen*=gender of household head (male=1, female=0), *Age*=age of household head, *Eco* = economic sector, dummy *Sta* = state (Selangor=1, Kelantan=0) and dummy *Loc* = location (Urban=1, Rural=0).

These models adopt Seemingly Unrelated Regression (SUR) as they are analysed simultaneously. Note that the independent variables for each equation is not the same because these variables are the main factor based on consumption types. This approach is in line with Keshavarzi et al. (2013) and Ni Lar et al. (2011). Different

with Ordinary Least Square (OLS), SUR is a method of estimation without endogeneity bias and disturbances across equation can be correlated.

METHOD OF DATA ANALYSIS

SEEMINGLY UNRELATED REGRESSION

The SUR is an econometric model with its own parameter which is often applied in solving unrelated several regression equations. It is more efficient and significant to estimate regression using SUR than OLS equations because there is the error correlations between each equation in SUR (Binkley & Nelson 1988; Zellner 1962). It implies that dependent variables consist of the same source of explanatory variables. Besides, SUR estimates the multiple regression simultaneously. In contrast to OLS, the SUR is selected because this study considers the error terms are contemporaneously correlated and the SUR estimator leads to efficient parameter estimates (Yahya et al. 2008). The SUR is more reliable for small sample data than OLS. The two main motivations using SUR are to increase efficiency in estimation by combining information on different equations and impose and/or test restrictions that utilise parameters in different equations. This section compares the efficiency between OLS and SUR. OLS can be single or multivariate-single equations which comprise only one dependent variable in each equation. The OLS also called linear least square, minimises the sum of square of the differences between the observed predicted values by a linear function of a set of explanatory variables. It can also be illustrated in matrix form and can be simplified as in Eq. (5) in the Appendix.

WALD TEST

After estimating the analysis of SUR, the findings are observed by checking insignificant independent variables (explanatory variables). The insignificant variable should be tested using Wald Coefficient to ensure whether there is a relationship between the insignificant variables with their associated dependent variable. The Wald test determines whether these insignificant variables should be omitted or not.

EMPIRICAL RESULT

Table 3 illustrates the results of determinants of food, housing, communication and transportation consumption expenditures. The explanatory variables vary (refer to Eq. (1), (2), (3) and (4)) for each consumption expenditure. Based on Table 3, there are significant contributions between total monthly spouse income (*Inc*), total borrowing (*Bor*), number of dependents (*Dep*), age of household head (*Age*) and economic sector (*Eco*) towards

TABLE 3. Determinants of consumption expenditures

Consumption Expenditures	Eq. (1) Food <i>CF</i>	Eq. (2) Housing <i>CH</i>	Eq. (3) Communication <i>CC</i>	Eq. (4) Transportation <i>CT</i>
Variables	Coef. (Z)	Coef. (Z)	Coef. (Z)	Coef. (Z)
$\alpha_0/\beta_0/\gamma_0/\delta_0$	0.0520 (0.24)	0.0783 (0.39)	0.0729 (0.30)	0.0783 (0.39)
Income	0.0937 (1.77)*	0.1921 (3.98)***	0.1170 (1.99)**	0.2846 (5.99)***
Saving	0.0338 (0.86)	-0.0634 (-1.76)*	-0.0008 (-0.02)	0.0637 (1.80)*
Borrowing	0.1037 (2.24)**	0.4914 (11.64)***	0.1758 (3.42)***	0.1723 (4.14)***
Dependent	0.2039 (5.80)***	-0.0462 (-1.44)	0.1277 (3.27)***	0.0381 (1.21)
Study Experience	0.0560 (1.28)	0.1149 (2.88)**	0.2678 (5.50)***	0.2356 (5.98)***
Marital Status	0.0243 (0.98)	0.0173 (0.76)	0.0405 (0.141)	0.0085 (0.38)
Gender	0.0247 (0.87)	0.0696 (2.68)**	0.0514 (1.62)	0.0771 (3.01)**
Age	0.0843 (2.17)**	-0.0906 (-2.55)**	-0.1010 (-2.34)**	-0.0470 (-1.34)
Economic sector	-0.0006 (-1.74)*	-0.0001 (-0.43)	0.0003 (0.85)	-0.0003 (-0.90)
State	0.0434 (0.48)	-0.0255 (-0.31)	0.0828 (0.82)	-0.0501 (-0.61)
Location	-0.0227 (-0.34)	-0.0196 (-0.32)	-0.0216 (-0.29)	-0.0280 (-0.46)
State*Location	0.0926 (1.12)	0.0922 (1.23)	-0.0700 (-0.77)	0.0519 (0.70)
RMSE	0.1991	0.1816	0.2211	0.1790
R-square	0.2764	0.5132	0.2862	0.4892
chi2	168.47	465.00	175.86	422.37
P-value	0.000***	0.000***	0.000***	0.000***

Note: *, **, ***Significant at level 10, 5 and 1 percent

food consumption (refer to Eq. (1). These results imply that these variables affect food consumption. However, there is no relationship between monthly saving (*Sav*), number of year of study experience (*Edu*), marital status (*MS*), dummy gender of household head (*Gen*), dummy state (*Sta*), dummy location (*Loc*) and interaction of state*location (*StaLoc*).

Housing consumption is a major consumption expenditure since it contributes large portion from total consumption expenditure with $R^2 = 51.32\%$. Eq. (2) regresses the housing consumption with its explanatory variables. The total borrowing (*Bor*) is the main factor with positive affecting the housing consumption followed by total monthly spouse income (*Inc*), number of year of study experience (*Edu*), dummy gender of household head (*Gen*) and negatively affected by monthly saving

(*Sav*) and age of household head (*Age*). The remaining factors do not influence housing consumption. It means that these remaining factors are not important in terms of housing consumption. The negative effect indicates that the housing consumption increase in higher age. Second, the negative effect yields that the higher monthly saving will reduce consumption.

In Eq. (3), monthly saving (*Sav*), marital status (*MS*), dummy gender of household head (*Gen*) and economic sector (*Eco*), dummy state (*Sta*), dummy location (*Loc*) and interaction of state*location (*StaLoc*) are not significantly related to communication consumption except the total monthly spouse income (*Inc*), total borrowing (*Bor*), number of dependents (*Dep*) and number of year of study experience (*Edu*) and age of household head (*Age*). Those significant variables

are very important in changing the communication consumption especially total monthly spouse income.

According to Eq. (4), when the total monthly spouse income (*Inc*) and number of year of study experience (*Edu*) increases, then the transportation consumption increases. Besides, the total monthly spouse income (*Inc*) and number of year of study experience (*Edu*) are the highest determinants of transportation consumption because their coefficient are the highest and quite similar. The third contributor to transportation consumption is the total borrowing (*Bor*), followed by dummy gender of household head (*Gen*) and monthly saving (*Sav*).

These four regressions will be discussed in detail in the next section after the Wald test. The R-square specifies the efficiency of these models. When the R-square is high, then the model is considered to be good. Hence, from the output of Table 3, the model of housing consumption is the highest. All four models have an R-square over 0.27, which means they explain these four consumptions expenditures.

After analysing SUR and since as all the result in Table 3 have insignificant regressors (explanatory variables), they are tested by the Wald Test to ensure whether these insignificant variables should be omitted or not. If the test is not significant between dependent and explanatory variables, then these variables are considered unrelated and should be removed, or vice versa. According to Table 4, all the models indicate insignificant results with probability higher than 0.05. This shows that these insignificant variables must be retained as they are correlated.

After removing the insignificant variables, then the analysis of SUR is re-implemented to obtain accurate results. The final result in Table 5 indicates that only the total monthly spouse income (*Inc*), total borrowing (*Bor*) and number of dependents (*Dep*) have significant impact to the food expenditure. Therefore, it implies that the increase in 1 unit coefficient of the total monthly spouse income (*Inc*), total borrowing (*Bor*) and number of dependents (*Dep*) in Eq. (1). Thus it simultaneously will increase 0.2206, 0.1132 and 0.2146 units of *CF* (food consumption) respectively. In other words, the total monthly spouse income (*Inc*), total borrowing (*Bor*) and number of dependents (*Dep*) significantly contribute to the food consumption. Meanwhile, indicates that only the total monthly spouse income (*Inc*), total borrowing

(*Bor*) and number of dependents (*Dep*) have significant impact to the food consumption. Then, it results in the increase in 1 unit coefficient of according to the (Table 5), increasing 1 unit in the total monthly spouse income (*Inc*), total borrowing (*Bor*), number of year of study experience (*Edu*), monthly saving (*Sav*), dummy gender of household head (*Gen*) and age of household head (*Age*). These result portrayed these coefficients in Eq. (2). It will raise 0.2483, 0.4913, 0.1077, 0.0495 and reduce 0.0667, 0.1335 units of *CH* (housing consumption) respectively. It states that the total monthly spouse income (*Inc*), total borrowing (*Bor*), number of year of study experience (*Edu*) and dummy gender of household head (*Gen*) positive significantly contribute to the housing consumption. Whereas, monthly saving (*Sav*) and age of household head (*Age*) negative significantly contribute to the housing consumption. Besides, the Table 5 also indicate that increasing 1 unit in the total monthly spouse income (*Inc*), total borrowing (*Bor*), number of dependents (*Dep*), number of year of study experience (*Edu*) and age of household head (*Age*) with their coefficients in Eq. (3). It will increase 0.1439, -0.0084, 0.1732, 0.1423, 0.2538 and -0.0899 units of *CC* (communication consumption) respectively. It shows that the total monthly spouse income (*Inc*), total borrowing (*Bor*), number of dependents (*Dep*) and number of year of study experience (*Edu*) positive significantly contribute to the communication consumption and age of household head (*Age*) negative significantly contributes to the communication consumption. A similar interpretation can also be described in Eq. (4) (Table 5), that increasing 1 unit in the total monthly spouse income (*Inc*), monthly saving (*Sav*), total borrowing (*Bor*), number of dependents (*Dep*) and number of year of study experience (*Edu*) will increase 0.3282, 0.0560, 0.1757, 0.0720 and 0.2293 while age of household head (*Age*) decrease 0.0776 units of *C_t* (transportation consumption) respectively. It presents that the total monthly spouse income (*Inc*), monthly saving (*Sav*), total borrowing (*Bor*), number of dependents (*Dep*) and number of year of study experience (*Edu*) positive significantly contribute to the transportation consumption and while age of household head (*Age*) negative significantly contribute to the transportation consumption.

The R-square for all models is higher than 0.18 for the model of *CF* (food consumption), *CH* (housing

TABLE 4. Wald Test for each consumption expenditure

Consumption Expenditure	Chi-square	Prob.	df	Null Hypothesis
<i>CF</i>	55.63	0.0000***	7	Sav=0, Edu=0, MS=0, Gen=0, Sta=0, Loc=0, StaLoc=0
<i>CH</i>	26.44	0.0001***	5	Dep=0, Eco=0, Sta=0, Loc=0, StaLoc=0
<i>CC</i>	10.65	0.0998*	6	Sav=0, MS=0, Gen=0, Eco=0, Sta=0, Loc=0, StaLoc=0
<i>CT</i>	15.02	0.0357**	7	MS=0, Gen=0, Eco=0, Sta=0, Loc=0, StaLoc=0

Note: *, **, ***Significant at level 10, 5 and 1 percent

TABLE 5. Determinants of consumption expenditure (after Wald Test)

Consumption Expenditures	Eq. (1) Food <i>CF</i>	Eq. (2) Housing <i>CH</i>	Eq. (3) Communication <i>CC</i>	Eq. (4) Transportation <i>CT</i>
Variables	Coef. (Z)	Coef. (Z)	Coef. (Z)	Coef. (Z)
$\alpha_0/\beta_0/\gamma_0/\delta_0$	0.1973 (5.80)***	0.1179 (1.89)*	0.1719 (4.24)***	0.0980 (2.97)***
Income	0.2206 (4.72)***	0.2483 (5.16)***	0.1439 (2.50)**	0.3282 (7.02)***
Saving		-0.0667 (-1.81)*	-0.0084 (-0.19)	0.0560 (1.59)*
Borrowing	0.1132 (2.34)**	0.4913 (11.33)***	0.1732 (3.34)***	0.1757 (4.15)***
Dependent	0.2146 (6.06)***		0.1423 (3.86)***	0.0720 (2.37)**
Study Experience		0.1077 (2.63)***	0.2538 (5.22)***	0.2293 (5.89)***
Marital Status		0.0047 (0.21)		
Gender		0.0495 (1.96)***		
Age	0.0220 (0.62)	-0.1335 (-3.86)***	-0.0899 (-2.19)**	-0.0776 (-2.32)***
Economic sector	-0.0004 (-1.00)			
RMSE	0.1991	0.1870	0.2238	0.1828
R-square	0.1851	0.4839	0.2689	0.4671
chi2	101.81	412.83	163.11	385.03
P-value	0.000***	0.000***	0.000***	0.000***

Note: *, **, ***Significant at level 10, 5 and 1 percent

consumption), *CC* (communication consumption) and *CT* (transportation consumption). The value of R-square proves the level of importance of the regressors towards the dependent variables. In this case, 18.51 percent *CF* (food consumption) can be explained by the total monthly spouse income (*Inc*), total borrowing (*Bor*) and number of dependents (*Dep*) while 81.49 percent *CF* (food consumption) can be explained by other factors. Furthermore, the regressors used in models *CH* (housing consumption) and *CT* (transportation consumption) are quite high where more than 46 percent managed to explain these models. Meanwhile, the state, location and interaction effect of state*location are not significant for all consumptions expenditure models. It indicates that the state, location and interaction effect of state*location do not affect every consumption expenditure.

CONCLUSION

The results reveal that the total monthly spouse income (*Inc*) and total borrowing (*Bor*) have a significant impact

on basic consumption expenditures for food, housing, transportation and communication. Also, SURE with interaction term of state and location indicates that there is no difference in the basic needs expenditure between urban and rural households in Selangor and Kelantan. This relationship suggests a new behaviour model of Muslim households. Several recommendations derived from the implications of this study are as follows:

First, the prudent spending modules which refer to the basis of consumer education should be conducted since early childhood. It is important to ensure that people are capable of managing their own and family expenses well. According to Rahimin Affandi et al. (2013), the study of consumerism through the 'Islamic Consumerism Fiqh' should practice the concept of tauhid, worship, al-falah and duty as the khalifah of Allah, educate users to avoid wastage, luxury, fraud and environmental damage, and promote the use of beneficial goods for the public. More importantly, it should support the development of Islamic economics more than non-Islamic economics.

Second, the establishment of individual self-quality provides a better understanding of Tasawwur Islam. Basri (2003) outlined the six main points towards building a community with strong aqidah, faith and ideology which consist of the Aqidah purity and obedience to Allah and the Messenger, worship, knowledge, Shariah lesson, humanitarian values, honesty and amar ma'ruf and nahi mungkar. With this, consumption expenditure will be Islamic compliant. Third, conventional economics emphasises maximising satisfaction (Basri 2003). It should be replaced with the Islamic economic system that focuses on income distribution and risk sharing.

Fourth, national economic policy should be formulated based on the Shariah. It can be easier to identify comparisons between Shariah and economics. Combing economic experts as a policymaker and Muslim religious scholars is necessary towards the development of a knowledgeable society. It can be organised by seminars, workshops, symposia, colloquium or papers (Basri 2003). Likewise, the education system should produce knowledgeable graduates in terms of consumerism. Meanwhile, learning the importance of Islamic economics should be taught at primary and secondary levels.

Finally, a financial management in accordance with the Al-Quran should be established to manage and spend wealth in line with the Shariah. Islam provides an easy way to acquire, produce and utilise the property wisely through wealth creation, property collection, property protection, property distribution and property purification (Norhazlina Ibrahim 2014).

Islam promotes the concept of spending prudently with basic needs, complement and embellishment necessities. As a human being awarded by God in this world, it is very important to distinguish between the needs and wants for the purpose of consumerism. In Al-Quran, many verses refer to being grateful for Allah's grace (surah Ibrahim, verse 7), moderate in shopping (surah Al-Furqan, verse 67), property is a one of the pleasures of this world (Surah Al-Anfal, Al-Kahfi, verse 46) and donate in the path of Allah (Surah Al-Baqarah: 195). If every Muslim appreciates what God has revealed, surely the 'Islamic Consumer Ethics' can be applied by today's Muslim community. Indeed, the best consumption practice for Muslims should refer to Al-Quran and Hadith. Everything in the earth belongs to Allah who created mankind. Human beings may plan their consumption, but it shall always be under the control of Islamic teachings. Al-Furqan verse 67 mentioned that good consumption behaviour is not being excessive in spending wealth nor stingy or ungenerous, but the best consumption is in moderation. Therefore, to understand the concept of 'wasatiyyah' (moderation), it is important to appreciate the meaning of gratitude to God for all His blessings and rewards. The best consumption practice for Muslims should be

refers to Al-Quran and Hadiths. Everything's in the earth are belonging to Allah that is created for human being. Human beings may plan their consumption, but it shall be always under the control of Islamic teaching with the priorities of daruriyyat (basic), hajiyat (requirement) and tahsiniyyat (complimentary) necessity in daily life.

Islam promotes modest expenditure and consumption as far as we can control or restrain our passions and excessive spending. We as Muslims should be aware and ready for times of distress and hardship. If we have already managed our expenses according to the Islamic rules, then Allah will advance our business and multiply His rewards and blessings. Even more, Allah will give us the extra so that we could save it in order to anticipate the unexpected things or to support future generations.

It is hoped that these proposals and suggestions will benefit policymakers, related parties and ethnic and religious communities especially Muslim communities who support the Islamic economy. It also extends the literature on Islamic consumption model to help Islamic consumption patterns.

LIMITATIONS OF THE STUDY AND DIRECTIONS FOR FUTURE RESEARCH

There are several limitations associated with this study. Due to the time and budget constraint, the respondents were only limited to Selangor and Kelantan. This might affect the generalisability of the findings. Therefore, it is suggested to fill the gap in the measurement of Muslim consumption patterns by presenting a measuring expenditure based on other ethnicities and in different states in Malaysia. Since all the respondents are Muslims, the result of this study cannot be generalised to the entire Malaysian population. Nevertheless, this research could be the basis for future research and recommendations to the policymakers.

REFERENCES

- Adriana, C. & Barry, R. 2007. Do Migrant Remittances Affect the Consumption Patterns of Albanian Household. *South-Eastern Europe Journal of Economics* 1(2007): 25–54.
- Amin, H., Hamid, M.R.A., Lada, S. & Baba, R. 2009. Cluster Analysis for Bank Customers' Selection of Islamic Mortgages in Eastern Malaysia: An Empirical Investigation. *International Journal of Islamic and Middle Eastern Finance and Management* 2(3): 213–234.
- Andreas, C. & Alessio, M. 2010. Retrospectives: Engel Curves. *Journal of Economic Perspectives* 24(1): 225–240.
- Basri Abd. Ghani. 2003. *Penggunaan Dalam Ekonomi: Analisis Dari Perspektif Islam*. Kuala Lumpur: Penerbit Universiti Malaya.
- Binkley, J. K., & Nelson, C. H. 1988. A Note on the Efficiency of Seemingly Unrelated Regression. *American Statistician* 42(2): 137–139.

- Hirschman, E. C. 1983. Religious Affiliation and Consumption Process: An Initial Paradigm. *Journal of Research in Marketing* 6: 131–170.
- Keshavarzi, S., Ayatollahi, S. M. T., Zare, N., & Sharif, F. 2013. Quality of Life of Childbearing Age Women and Its Associated Factors: An Application of Seemingly Unrelated Regression (SUR) Models. *Quality of Life Research* 22(6): 1255–1263.
- Khalaf, G. 2013. A Comparison between Biased and Unbiased Estimators in Ordinary Least Squares Regression. *Journal of Modern Applied Statistical Methods* 12(2): 293–303.
- Kotler, P. 2000. *Consumer Market and Consumer Behavior. Principles of Marketing*. New Jersey: Prentice Hall.
- Lada, S., Tanakinjal, G.H. & Amin, H. 2009. Predicting Intention to Choose Halal Products Using Theory of Reasoned Action. *International Journal of Islamic and Middle Eastern Finance and Management* 2(1): 66–76.
- Laily, P. & Lokman, I. 2005. Perbelanjaan Pengangkutan dan Komunikasi dalam Kalangan Pengguna di Batu Pahat, Johor. *Malaysian Journal of Consumer & Family Economics* 8(2005).
- Laily, P & Nurizan, Y. 2004. *Kesejahteraan Isi Rumah Johor Darul Takzim*. Serdang: Universiti Putra Malaysia.
- Md Taib, Fauziah, Ramayah, T., & Abdul-Razak, D. 2009. Factor Influencing Intention to Use Diminishing Partnership Home Financing. *International Journal of Islamic and Middle Eastern Finance and Management* 1(3): 235–248.
- Mokhlis, S. 2009. Relevancy and Measurement of Religiosity in Consumer Behavior Research. *International Business Research* 2(3): 75–84.
- Ni Lar, Calkins, P., Leeaham, P., Wiboonpongse, A., Phuangsaichai, S., & Nimanussornkul, C. 2011. Determinants of Food, Health and Transportation Consumption in Mawlamyine, Myanmar: Seemingly Unrelated Regression Analysis. *International Journal of Intelligent Technologies and Applied Statistics* 4(2): 165–189.
- Norazmawati M. S. 2007. Kemampuan Pemilikan Rumah Kos Rendah di Kuala Lumpur. Retrieved 1 January 2018 from http://eprints.usm.my/9096/1/KEMAMPUAN_PEMILIKAN_RUMAH_KOS_RENDAH_DI_KUALA_LUMPUR.pdf
- Overseas Development Institute. 1978. Definition of Basic. Retrieved 10 January 2018 from Needs. <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/6616.pdf>
- Pindyck, R. S. & Rubinfeld, D. L. 2005. *Microeconomics*. Pearson International Edition. New Jersey; Prentice-Hall, Upper Saddle River.
- Pistafferri, L. 2006. Household Consumption: Research Questions, Measurement Issues, and Data Collection Strategies, Manuscript for Workshop on New Household Panel Survey, Department of Economics, Stanford University.
- Rosadah, M. & Khadijah, H. 2002. Kajian ke atas Keupayaan Golongan Berpendapatan Sederhana dalam Memiliki Rumah di Kawasan Johor Bahru. Johor Bahru. Project Report. UTM. (Unpublished). Retrieved 7 Januari 2018 from <http://eprints.utm.my/id/eprint/2952/1/71693.pdf>
- Sharifah A. Haron, Laily Paim & Nurizan, Y. 2005. Towards Sustainable Consumption: An Examination of Environment Knowledge Among Malaysians. *International Journal of Consumer Studies* 29: 426–436.
- Sparks, R. 2004. SUR Models Applied to an Environmental Situation With Missing Data and Censored Values. *Journal of Applied Mathematics and Decision Sciences* 8(1): 15–32.
- Syed Shah Alam, Rohani Mohd & Badrul Hisham. 2011. Is Religiosity an Important Determinant on Muslim Consumer Behaviour in Malaysia? *Journal of Islamic Marketing* 2(1): 83–96.
- Wook, E., Fariza, A. & Norain, M. A. 2007. Gelagat Permintaan Pengguna Terhadap Makanan Luar: Kajian Kes di Ipoh, Klang dan Seremban. *Malaysian Journal of Consumer & Family Economics* 10.
- Yahya, W.B, Adebayo S.B, Jolayemi E.T, Oyejola B.A, & Sanni O.O.M. (2008). Effects of Nonorthogonality on the Efficiency of Seemingly Unrelated Regression (SUR) models. *InterStat Journal*: 1–29.
- Yaty Sulaiman, Nik Kamariah Nik Mat & Noor Hasmini Abd Ghani. 2014. Constructing a Consumption Model for Malaysian Consumers. *Journal of Marketing Management*. December 2014 (2): 49–60.
- Zellner, A. 1962. An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias. *Journal of the American Statistical Association*: 57(298): 348–368.
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APPENDIX

$$Y_i = X_i\beta + \varepsilon_i \tag{5}$$

Where Y_i is the vector of i th dependent variable of N observations,

X_i is $i \times k$ matrix of explanatory variables of i th,
 ε_i is $i \times 1$ vector of disturbances or errors (uncorrelated errors with mean zero and common unknown variance),
 α is $k \times 1$ vector of unknown population parameters

Moreover, using the existing estimator, $\beta_{iOLS} = (X_i^T X_i)^{-1} X_i^T Y_i$, all the unknown parameters in the model can be estimated. However, if each of these equations is run separately, then there is no correlation between error terms and implies $E(\varepsilon_i \varepsilon_j) = 0$ (Khalaf, 2013).

SEEMINGLY UNRELATED REGRESSION

This method is proposed by Zellner (1962) to estimate coefficient in encountered sets of regression equations. Eq. (6) shows simple notation of all equations are arranged into a single equation in matrix form as following:

$$\begin{bmatrix} Y_1 \\ Y_2 \\ M \\ Y_p \end{bmatrix} = \begin{bmatrix} X_1 & 0 & 0 & 0 \\ 0 & X_2 & 0 & 0 \\ 0 & 0 & O & 0 \\ 0 & 0 & 0 & X_1 \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ M \\ \beta_p \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ M \\ \varepsilon_p \end{bmatrix} \tag{6}$$

Furthermore, this Eq. (6) can be simplified into general form as Eq. (7) (Sparks, 2004):

$$Y = X\beta + \varepsilon \tag{7}$$

Where the size $Y = MT \times 1$, $X = MT \times \Sigma I$, $\beta = \Sigma I \times 1$ and which $e = MT \times 1$ is identity matrix.

As mentioned before, these equations is run simultaneously, then there is correlation between error terms and implies $E(\varepsilon_i \varepsilon_j) \neq 0 = \sigma_{ij} I_T$. SUR estimator to estimate the regression is represent in Eq. (8) (Sriboonchitta, 1983):

$$\beta_{iSUR} = (X_i^T \Sigma^{-1} X_i)^{-1} X_i^T \Sigma^{-1} Y_i \tag{8}$$

Where Σ^{-1} is a weighting matrix based on the covariance matrix of the error terms Σ .

With asymptotic covariance matrix

$$Var(\beta_{iSUR}) = (X_i^T \Sigma^{-1} X_i)^{-1} \tag{9}$$

Where

$$\Sigma_c = \begin{bmatrix} \sigma_{11} & L & \sigma_{1n} \\ M & O & M \\ \sigma_{n1} & L & \sigma_{nn} \end{bmatrix}$$

The unknown true error terms are substituted by observed residuals from OLS estimates

$$\varepsilon_i = Y_i - X_i \beta_{iOLS}$$

Hence, element the covariance matrix can be obtained by Eq. (10) which is

$$\sigma_{ij} = \frac{\varepsilon_i \varepsilon_j}{N} \tag{10}$$

