Determinants of Marital Dissolution: A Cox Regression Model

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Abstract: - The dissolution of marriage, also known as divorce, occurs when the bond of matrimony between a married couple is dissolved. Since the rate of divorce is on the rise, this study aims to identify potential determinants affecting the dissolution of marriage using survival analysis. We retrospectively studied 531 secondary data of the Muslim couples who filed for divorce in Selangor. The age at marriage of husband and wife, presence of children, duration of marriage, couples’ educational level and employment status, household income and counseling session were identified as potential determinants. From the result, about 12.05% decide to proceed with divorce and about 87.95% want to save their marriage. The Kaplan-Meier plot shows a higher survival rate of marriage within the first 83 days of the study and the survival curve decreases gradually as the number of days increase. Result from the Cox model shows that age at marriage of husband and attending counseling session significantly affect marital dissolution.

Key-Words: - Divorce, survival, Kaplan-Meier plot, Cox Proportional Hazards

1 Introduction

Marriage is a legal process in uniting man and woman in a legal union as a spouse. In Islam, marriage is the only halal or legitimate way in satisfying in intimacy between couples. According to [1], marriage helps in reducing chronic illness such as heart attack since it gives the married couples happiness and huge sense of emotional support and care in their live [2]. Other studies indicate that the levels of psychological and physical well-being are higher compared to those who are single [3 – 5]. However the live of marriage is not always in a smooth lane. There is a time when husband and wife are almost impossible to live which each other and divorce is the best resolution rather live indefinitely. According to the Islamic Development Department (JAKIM) reported in The Star Online [6] about 20% to 25% of Muslim marriages were dissolved every year compared to the number registered in Malaysia. The trending of divorce kept on increasing from the year 1990 to the year 2010. [7] reported the divorce rate for non-Muslim and Muslim is between 2.6% to 7.19% and 14.45% to 15.5% respectively from 2000 until 2005.

The duration of marriage among Muslims in Malaysia varies according to the different factors such as the age at marriage, educational level and employment status. According to the Malaysia Quality of Life Index (MQLI) 2011, the divorce rates at the age of 18 to 50 years old among Malaysians had increased by 0.22 percent in 2010 compared to 0.13 percent in 2000 [8]. There are few factors that affect the survival of marriages such as the age at marriage of husband and the age at marriage of wife [9-10]. The third factor is the presence of children [9,11] and the fourth factor is the duration of marriage [12-13]. The rising rate of the divorce cases is worrying and it needs to be given an appropriate attention [8]. In overcoming this situation, a counselling session is said to be crucial in reducing the intensity for divorcing [14].

The objective of this study is to identify potential determinants affecting the dissolution of marriage using survival analysis.

2 Modeling the Dissolution of Marriage

2.1 Data Description

A retrospectively study employed a secondary data from the Islamic Religious Department in Selangor known as Jabatan Agama Islam Selangor (JAIS).
This study covered the real data from the cases reported by Muslim couples, who filed for a divorce from 1st January to 31st December, 2012 in one of the urban districts in Selangor. There were about 583 files opened during the twelve months period, however only 531 cases were applicable for the study. This study include cases in which couple is planning to divorce through Syariah Court involving faskh, talak or ta’liq. The information used in the study consists of:

i. the age at marriage of husband and wife,
ii. presence of children,
iii. duration of marriage,
iv. educational level of husband and wife,
v. employment status
vi. household income and
vii. counseling session attended

2.2 Survival Analysis
We determine the distribution of survival time of marriage in couples who seek for divorce by using Kaplan-Meier method in estimating the survival function. There are six steps in calculating the survival time in Kaplan-Meier:

Step1: Determine \( j \) as person notify where \( j = 1, 2, \ldots, n \).

Step 2: Determine \( t_j \) as the length of survival of marriage for \( j \)th person.

Step 3: Determine \( r_j \) as the number of person not yet divorce.

Step 4: Find using equation as following:

\[
q_j = \frac{d_j}{r_j} \quad (1)
\]

where:

\( q_j \) = the probability of divorce over the interval which

\( d_j \) = number of simultaneous failure (divorce), marked the end of \( j \)th subinterval

\( r_j \) = risk set for the \( j \)th subinterval which is the number of persons in the sample not yet divorce, marked the end of \( j \)th subinterval

Step 5: Find \( \hat{S}(t_j) \) using the equation:

\[
\hat{S}(t_j) = \prod_{j-1}^{m}(1 - q_j) = \prod_{j-1}^{m}(p_j) \quad (2)
\]

where:

\( \hat{S}(t_j) \) = overall probability of the survival of marriages over time at \( j \)th time

\( q \) = probability of divorce of a single subject over the interval which ends at \( j \)th time.

\( p \) = probability of marriage of a single subject over the interval at \( j \)th time.

Step 6: Plot the graph for the overall probability of the survival over time, \( \hat{S}(t_j) \) versus length of survival period, \( t \).

We investigate the factors contributing to divorce using the Cox Proportional Hazards (Cox PH) model as given below:

\[
\lambda(t; z) = \lambda_0(t) \cdot \exp(z \cdot \beta) \quad (3)
\]

The analyses used in this study were run using the R Programming.

3 Results and Discussions
3.1 Survival Time
Table 1 presents the summary of the survival time (in days) for the 531 Muslim couples in Selangor. On the average, the survival time for marriage was 114.9 days with the minimum survival time recorded to be one (1) day. The number represents the days in which the couples reported to file for a divorce and attending the counseling session at the Islamic Religious Department in Selangor for the year of 2012.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Average</th>
<th>SD*</th>
<th>Median</th>
<th>Min time</th>
<th>Max time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival Time (Days)</td>
<td>114.9</td>
<td>93.99922</td>
<td>83</td>
<td>1.0</td>
<td>615.0</td>
</tr>
</tbody>
</table>

SD = standard deviation

From Figure 1, the Kaplan-Meier (KM) illustrates the censored (stayed married) and uncensored data (get a divorce) with the vertical dashes represent the censored data. The higher survival rate was at days 83 of the study and the curve is decreasing gradually as the number of days increase.
3.2 Assumption of Cox PH and Criterion Selection

Before using the Cox PH model, it is necessary to check the underlying assumption of PH. Schoenfeld residuals show that all the potential determinants met the assumptions (not shown). Then, the Cox PH model is fitted to the data. Table 2 shows the result of the models with the main effect and interaction effect. Result indicates that Model 3, which includes the age of marriage of husband and attending counselling session as their predictor variables is more significant compared to the other models based on the lowest Akaike Information Criterion (AIC). The positive value indicates that the hazard (risk of divorce) is higher while the negative value indicates that the hazard is lower.

Based on Table 3, the proportional hazard relationship for the model for the risk of divorce is as given below:

$$\lambda(t; z) = \lambda_0(t) \exp\{22007 \times \text{age at marriage husband} + 0.23 \times \text{attended counseling session}\},$$

where the baseline hazard function, $\lambda_0(t)$ is unspecified.

The model shows that for the covariate age at marriage of husband, the risk of divorce increases about 1.22 ($\beta_1$) times as age increases. The 95% confidence interval for the age at marriage of husband did not include 1.000 (1.0647, 1.3981) suggest that there is a difference in the survival of marriage between groups in this variable. Couples who attended the counselling session will reduce the risk of the divorcement by 0.23. Similarly, the 95% confidence interval for attending counselling session also did not include 1.000 (0.1351, 0.4144). This suggests that there is a difference in the survival of marriage between those who did not attend counselling session compared to those who attend.

Study by [15] revealed the same result between age at marriage and marriage dissolution in Canada. Report from [14] shows that couples who attend counseling session at least once, have lower risk to get a divorce compared to those who did not attend any session.

Table 2 Results of Multivariate Cox PH for four models

<table>
<thead>
<tr>
<th>Model</th>
<th>Factors</th>
<th>$\beta$</th>
<th>p-value</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age at marriage (husband)</td>
<td>0.3280</td>
<td>0.0231*</td>
<td>704.9315</td>
</tr>
<tr>
<td>2</td>
<td>Attend Counseling session</td>
<td>-1.4147</td>
<td>5.91e-07*</td>
<td>687.4218</td>
</tr>
<tr>
<td>3</td>
<td>Age at marriage (husband)</td>
<td>0.3379</td>
<td>0.0219*</td>
<td>681.5687</td>
</tr>
<tr>
<td></td>
<td>Attend Counseling session</td>
<td>-1.4223</td>
<td>5.27e-07*</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Age at marriage (husband)</td>
<td>0.29979</td>
<td>0.165</td>
<td>683.5657</td>
</tr>
<tr>
<td></td>
<td>Attend Counseling session (Age at marriage (husband))*(Attend Counseling session)</td>
<td>-1.68527</td>
<td>0.137</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.07135</td>
<td>0.810</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 5% level
Table 3 Parameter Estimates of Covariates and p-value for final model

<table>
<thead>
<tr>
<th>Factors</th>
<th>β</th>
<th>exp(β)</th>
<th>p-value</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at marriage (husband)</td>
<td>0.19891</td>
<td>1.22007</td>
<td>0.0042</td>
<td>(1.0647-1.3981)</td>
</tr>
<tr>
<td>Attend Counseling session</td>
<td>-1.44138</td>
<td>0.23360</td>
<td>4.64e-07</td>
<td>(0.1351-0.4144)</td>
</tr>
</tbody>
</table>

*Significant at 5% level

4 Conclusion
This study concludes that the husbands’ age at marriage and counseling session are the determinants found to be significant in the survival of marriage when using Cox regression model.

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References: