FORECASTING MOVIE DEMAND USING EXPONENTIAL SMOOTHING AND DELPHI METHODS

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FORECASTING MOVIE DEMAND USING TOTAL AND SPLIT EXPONENTIAL SMOOTHING AND DELPHI METHODS

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This study investigated the quantitative and qualitative methods in forecasting movie demand which are total and split exponential smoothing and Delphi methods respectively. In quantitative study, the performance of total and split exponential smoothing was evaluated and compared to other exponential smoothing methods in movie demand forecasting at the aggregate market level. Exponential smoothing methods were suggested because of their simplicity in formulation and generation of reliable forecasts. The forecasts can be generated with minimal effort in the formulation, thus, it tends to shorten the time to make a decision. Nevertheless, there is a limited application of exponential smoothing methods in movie demand forecasting. The model fitting criterion was also examined to see which criteria generate better forecasts. The data were daily sales series of movie market started from 1 January 2002 to 31 December 2016. Overall, the total and split exponential smoothing with optimised parameters was the best performing model. The identification of the best performing method assists distributors to make a decision on the best release date for their new movies earlier than the competitors. The forecasts generated able to give a general picture regarding the future trend of movie demand at the aggregate market level.

In a separate study, the qualitative study used the Delphi method to estimate the movie demand at individual movie level. Past research in motion picture claimed the great uncertainty of individual movie demand because of limited information. So, they suggested relying on judgements and intuition as inputs in the forecasting process when there is minimal data condition. Until now, there is no study using the judgemental method in demand forecasting at individual movie level. Eleven movies released in 2017 were selected. Results suggested that, at the individual movie level, the group produced better forecasts than an individual member with the Delphi method. There is an improvement in forecasting accuracy over the Delphi rounds.

Lastly, under the condition of great uncertainty, the combined forecasts generated better accuracy over the individual methods. With the proven benefits of Delphi method under great uncertainty of individual movie demand, it was able to give confidence for distributors and exhibitors to rely on judgemental methods other than statistical methods alone.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

RAMALAN PERMINTAAN FILEM MENGGUNAKAN KAEDAH-KAEDAH *EXPONENTIAL SMOOTHING* DAN DELPHI

Oleh

MAK KIT MUN

Januari 2019

Pengerusi : Choo Wei Chong, PhD
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Kajian ini menyiasat kaedah kuantitatif dan kualitatif dalam ramalan permintaan filem dengan menggunakan kaedah total and split exponential smoothing dan kaedah Delphi masing-masing. Dalam kajian kuantitatif, prestasi kaedah total and split exponential smoothing dinilai dan dibandingkan dengan kaedah exponential smoothing yang lain dalam ramalan permintaan filem di peringkat pasaran agregat. Kaedah exponential smoothing telah dicadangkan kerana kesederhanaan mereka dalam perumusan dan penjanaan ramalan yang boleh dipercayai. Ramalan boleh dihasilkan dengan usaha yang minimum dalam formulasi, oleh itu, ia cenderung untuk memendekkan masa untuk membuat keputusan. Walau bagaimanapun, terdapat penggunaan kaedah melicinkan eksponen terhad dalam ramalan permintaan filem. Kriteria pemasangan model juga dikaji untuk melihat kriteria yang menjana ramalan yang lebih baik. Data itu adalah siri harian jualan filem bermula dari 1 Januari 2002 hingga 31 Disember 2016. Secara keseluruhannya, total and split exponential smoothing dengan parameter yang dioptimumkan ialah model terbaik. Pengenalpastian kaedah terbaik membantu para pengedar untuk membuat keputusan pada tarikh keluaran terbaik untuk filem-filem baru mereka lebih awal daripada pesaing. Ramalan yang dihasilkan dapat memberikan gambaran umum tentang trend permintaan wayang pada masa depan di peringkat pasaran agregat.

Dalam kajian berasingan, kajian kualitatif menggunakan kaedah Delphi untuk meramalkan permintaan filem di peringkat filem individu. Penyelidikan yang lalu dalam gambar bergerak mendakwa ketidakpastian yang besar dalam permintaan filem individu kerana maklumat yang terhad. Jadi, mereka mencadangkan untuk bergantung pada penghakiman dan intuisi sebagai input dalam proses peramalan apabila terdapat keadaan data yang minimum. Sehingga kini, tidak ada kajian yang menggunakan kaedah penghakiman untuk meramalkan permintaan pada tahap filem individu. Sebelas filem-filem yang dikeluarkan pada tahun 2017 dipilih. Keputusan

mencadangkan bahawa, pada peringkat filem individu, kumpulan menghasilkan ramalan yang lebih baik daripada ahli individu dengan kaedah Delphi. Terdapat peningkatan dalam ketepatan ramalan sepanjang pusingan Delphi. Yang terakhir, di bawah keadaan ketidakpastian yang tinggi, ramalan gabungan menghasilkan ketepatan yang lebih baik berbanding dengan kaedah individu. Dengan faedah-faedah Delphi yang terbukti di bawah ketidakpastian besar permintaan filem individu, ia dapat memberi keyakinan kepada para pengedar dan peserta pameran untuk bergantung kepada kaedah judgemental selain daripada kaedah statistik sahaja.

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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF DIAGRAMS

LIST OF ABBREVIATIONS

ANN	Artificial neural network
APE	Absolute percentage error
APHR	Average percent hit rate
ARIMA	Autoregressive integrated moving average
ARMA	Autoregressive moving average
BBN	Bayesian belief network
BP	Back Propagation
DS	Double seasonal
DSS	Decision support system
DT	Decision tree
ES	Exponential smoothing
GES	General exponential smoothing
HW	Holt Winters
MAD	Mean absolute deviation
MAPE	Mean absolute percentage errors
MLBP	Multi-layer back propagation
MLP	Multi-layer perceptron
MPAA	Motion Picture Association of America
MSE	Mean squared errors
NN	Neural network
SAE	Sum of absolute errors
SES	Simple exponential smoothing
SMO	Sequential minimal optimization
SNS	Social network service

SSE	Sum of squared errors
STES	Smooth transition exponential smoothing
US	United States
WOM	Word-of-mouth

LIST OF NOTATIONS

α	Smoothing parameter for the level of the series
β	Smoothing parameter for the trend
Υ	Smoothing parameter for seasonal indices
ϕ	Damping parameter
S_t	Smoothed level of the series
T_t	Smoothed additive trend at the end of period t
R_t	Smoothed multiplicative trend at the end of period t
I_t	Smoothed seasonal index at the end of period t
X_t	Observed value of the time series in period t
m	Number of periods in the forecast lead-time
p	Number of periods in the seasonal cycle
$\hat{X}_t\,(m)$	Forecast for m periods ahead from origin t
y_t	Daily observations
W_t	Smoothed total weekly sales
L_t	Split of the weekly sales across the days of the week
$\hat{y}_t\,(m)$	Forecast for m periods ahead from origin t
e_t	Forecast error
p_t	Percentage error

CHAPTER 1

INTRODUCTION

Chapter 1 was the introduction of the study. It covered the background, problem statements, research questions, research objectives, significance of the study, terminology of definition, and conceptual framework.

1.1 Background

The motion picture industry is a multi-billion dollar business. This industry is one of the most rapidly growing globally. Global box office for all films released worldwide achieved $40.6 billion in 2017, up 5% over 2016's total (US$38.8 billion). Both U.S./Canada (US$11.1 billion) and international box office (US$29.5 billion), decreased 2% and increased 7% respectively when compared to 2016. International box office accounted for 73% of the total box office in 2017, increased two percentage points from 2016. The international box office was driven primarily by the Asia Pacific region (US$16.0 billion), with an increment of 6% as compared to 2016 (MPAA, 2018). Figure 1.1 has shown the graph of global box office from the year 2013 to 2017.

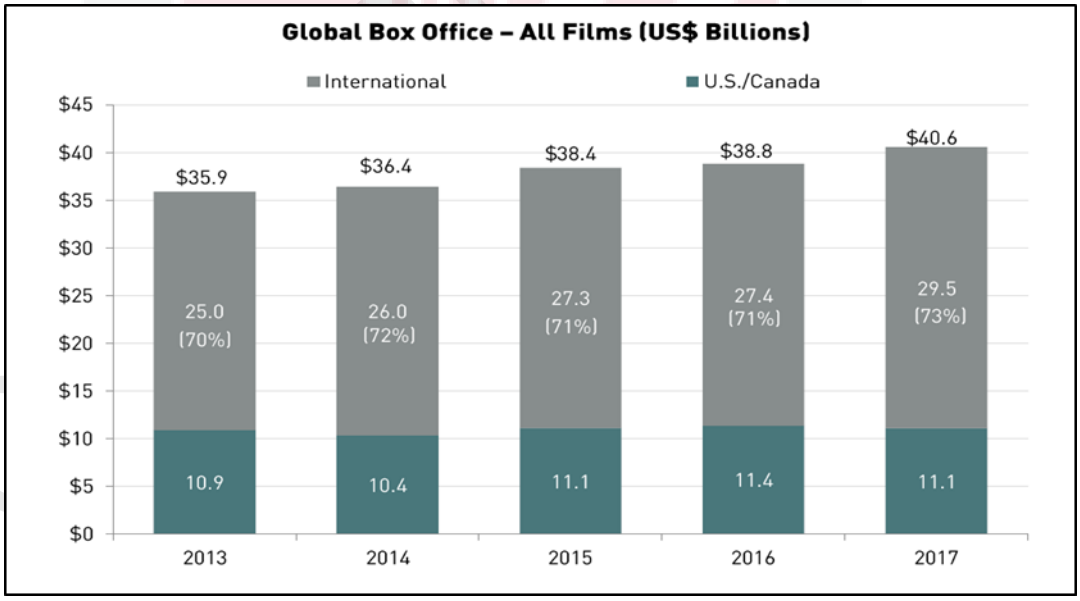

Figure 1.1 : Global Box Office-All Films
(Source : Theatrical market statistics 2017 MPAA, 2018)

The movie industry has some unique characteristics that make it very interesting to research in the perspective of new product forecasting (Sawhney & Eliashberg, 1996).

These characteristics included the complexity of the production process, a short product life cycle, and the uncertain nature of demand (Caves, 2000; Eliashberg, Elberse, & Leenders, 2006; Moul, 2005). Most revenues in the motion picture industry obtained from new movies since the exhibition period for a movie is below 15 weeks in the theatrical release. Demand for the new movie is uncertain, as movies are experiential products. Most cultural products except books are defined as experience goods with a short product life cycle (Chang & Ki, 2005). The movie industry believes that each film is unique, which make forecasting demand very tricky (Marshall, Dockendorff, & Ibanez, 2013). For these reasons, it is difficult for consumers to evaluate the movie until they have actually experienced it (Hirschman & Holbrook, 1982; Eliashberg & Sawhney, 1994; Marshall, Dockendorff, & Ibanez, 2013). Ultimately, the audiences will decide the fate of the movies (De Vany & Walls, 1999).

With reference to this issue, President of MPAA, Jack Valenti (1978) gave a speech regarding the unpredictability related to investments in a motion picture:

"With all of the experience, with all the creative instincts of the wisest of people in our business, no one, absolutely no one can tell you what a movie is going to do in the marketplace… Not until the film open in darkened theatre and sparks fly up between the screen and the audience can you say this film is right… Excellence is a fragile substance (Valenti, 1978, pg.7)."

This statement was supported by Goldman (1983). He stated that no one knows anything about the new movies until the audiences go and see it for themselves. As a consequence, the motion picture industry is emerging to become an area of interest to scholar and researchers. With the importance of new movies and uncertainty in predicting the box office performance of these new movies, the value of accurate box office forecasts is extremely high in this industry (Sawhney & Eliashberg, 1996).

With regard to the importance of movie demand forecasts, various approaches have been used by researchers in the task of predicting movie success in terms of box office revenues or theatre admissions. Models such as econometric and behavioural models are widespread in the study of motion pictures (Sharda & Delen, 2006). The most common method is incorporating the variables into the forecasting models. Exploring the variables in movie demand forecasting is the first priority when analysing the motion picture industry because it is a basic foundation for movie-related policy establishment (Yoo, 2002). Basically, the variables came from the theories of motion picture success stated by Litman (1983). Three decision making fields were being identified and believed to drive the success of movies: the creative sphere, the scheduling and release pattern, and the marketing effort. The impact of various explanatory variables on movie performance has been investigated in research studies, such as consumer behaviour, MPAA rating, director, star, distributor, genre, sequel, timing of release, degree of competition, word-of-mouth (WOM) and critique, award and nomination, film and advertising spending, country of origin, external events, seasonality, and number of screens has been investigated (e.g. Litman, 1983; Jones &

Ritz, 1991; Sawhney & Eliashberg, 1996; Eliashberg & Shugan, 1997; Ravid, 1999; Elberse & Eliashberg, 2003; Holbrook, 1999; Liu, 2006; Dellarocas et al., 2007; Einav, 2007; Elberse, 2007; Moon et al., 2010; Nelson & Glotfelty, 2012; Kulkarni et al., 2012; Goetzman, Ravid, & Sverdlove, 2013; Marshall et al., 2013; Eliashberg, Hui, & Zhang, 2014; Kim, Hong, & Kang, 2015; Ghiassi, Lio, & Moon, 2015). Indeed, the incorporating of variables in movie forecasting improves the accuracy of models (Sharda & Delen, 2006; Lee & Chang, 2009; Kim, Hong, & Kang, 2015).

Movie demand forecasting is a challenging but important task for distributors. In the decision making process, forecasting of movie demand is inevitable (Jun, Soo & Kim, 2011), not only for the already released film but also those waiting to be released (Hur, Kang, & Cho, 2016). When distributors distribute a new movie to theatres, they are required to make appropriate managerial decisions, in order to maximize the profit. The ability to accurately estimate the box office revenues will help the distribution companies to determine the release timing, marketing strategy and cost, period of showing the movie and number of screens. The release date of a new movie is their major focus as the first-week opening accounted for 40% of the box office revenues of average movies. Studios will compete with each other for the best movie's release date especially seasonal holidays (Einav, 2007). Marketing activities during these seasonal periods decide the success of new movies, so, it is exceptionally important to generate an accurate box office forecasts in the early stage of the screening (Sawhney & Eliashberg, 1996). It allows them to make appropriate decisions regarding the allocation of budgets and screens for additional marketing activities and the movie theatres respectively (Kim, Hong, & Kang, 2015) based on demand forecasts. So, a forecasting tool that able to capture the seasonality and generate reliable forecasts can be relied on, such as exponential smoothing methods, to give a general idea of the future demand for the movie market.

For exhibitors, based on estimates of the movie demand, they need to manage the yield from the exhibition capacity. The adjustments in distribution intensity are troublesome for the products to handle in short notice, however, it is different in movie theatres. Movie theatres have the flexibility in the allocation of screening capacity to a new movie every week. They can drop a movie from the theatre, shift one to a smaller screening room, or reduce the number of copies on a weekly basis (Sawhney & Eliashberg, 1996; Marshall, Dockendorff, & Ibanez, 2013). The exhibitors must exercise sound judgement in choosing movies to play in order to maximize its profit since the number of screens is constrained. This task presents considerable challenges for exhibitors because of the short life cycle of movies, the changing level of demand over time, the limited number of screens, and the complex revenue sharing between the exhibitor and distributor (Eliashberg, Weinberg, & Hui, 2008). Therefore, to deal with the limited number of screens from exhibitors' side and avoid competition from other distributors, the distributors must know the future trend of demand in movie market to decide on the release date earlier.

In this industry, an early and accurate forecast of box-office demand is a valuable tool in planning and decision making (Marshall et al., 2013). The estimated movie demand

can help distributors in negotiating contracts with exhibitors regarding the share of movie revenues. Under the contract, the exhibitors pay the distributors a fixed share of the box office revenues. The contractual share between the exhibitor and distributor are on a sliding scale. It typically begins at 90% or a lower share of the gross box office revenues in favour of the distributor and then declines throughout the movie run (Friedberg, 1992; Einav, 2007). The revenue share favours the distributors in the first few weeks of movie run, but shift to the exhibitors' favour later on (Swami, Eliashberg, & Weinberg, 1999). This is why exhibitors are concerned with revenues from the later stages of the movie run. Other than movie revenues shares, concession sales constitute the lifeblood of theatres (Friedberg, 1992). The contributions from concession sales never shared with distributors and constituted 50 to 75% of the operating margin from the sales. That's why exhibitors accept the sliding-scale contract that disproportionately favours the distributors (Sawhney & Eliashberg, 1996). To make the exhibition decision beyond the contractual period, exhibitors need to forecast the total contribution for each movie and negotiate with distributors on a weekly basis as the movie performance unfolds (Squire, 1992).

The motion picture business is a risky business. One of the reasons is the unpredictability of the public's taste. Another reason is the high-risk exposure of new movies to meet the break-even point (Kim et al., 2015). Only four out of every ten movies made breaks even or earns a profit (Vogel, 2001). Production decisions require distributors to forecast the expected performance of a movie at the early production stages. However, it has been a challenge for researchers for almost three decades to forecast the movie's demand accurately before its theatrical release (Eliashberg & Sawhney, 1996; Shugan & Swait, 2000; Simonoff & Sparrow, 2000). Forecasting before the release of new movies remains a difficult problem in the industry due to less explanatory variables and data to support (Sharda & Delen, 2006). Kahn (2014) also stated that new product forecasting characterises as little to no data. Thus, under this minimal data situation, a qualitative approach is required, with judgement and intuition as inputs in forecasts.

The important objective of this research is to provide insight into the usefulness of the newly proposed total and split exponential smoothing method by Taylor (2007) and judgemental method in movie demand forecasting in two separate studies with two different data. The total and split exponential smoothing was applied in the quantitative study to evaluate its demand forecasting performance in the movie industry. This method was developed for the forecasting of daily sales series. The total and split smoothing method is presented by Taylor (2007) in daily supermarket sales data and Taylor (2011) in monthly sales series of the publishing company. Taylor (2007) reported that the method performed well for daily supermarket sales data, particularly for short lead times. Other than these two papers, there is no other empirical evidence regarding the method. The components of the formulation involve smoothing the total weekly sales and the split of the total sales for each day of the week (Taylor, 2007). This new method will be applied to a data series consisting of the daily box office of the movie market taken from the official website. Then, the accuracy of this method was compared against other exponential smoothing methods. In the qualitative study, the judgemental method was applied in weekly demand

forecasting. Unlike the quantitative study, the forecasts were at individual movie level, not the overall movie industry. The Delphi method is selected over the other judgemental methods due to their superiority in forecasting performance.

1.2 Problem Statement

The development and improvement of models in movie demand forecasting are the main focuses of past research. These studies included econometric (e.g. Eliashberg, et al., 2009) and behavioural models (e.g. Gazley, Clark, & Sinha, 2011). They mainly explored how internal and external variables and consumer behaviours influence the accuracy in movie forecasting. The models have been proven that they improved the demand forecasting accuracy and performance of the movie industry in terms of a number of visitors and annual revenues. However, movie distributors still facing the two key challenges: (1) strategy of movie's release timing and (2) forecasting the box office performance of a movie after its production but prior to its theatrical release (Eliashberg et al., 2008).

1.2.1 Aggregate Market (Quantitative)

The release date of a movie is arguably the most difficult decision facing the distributors (Radas & Shugan, 1998). The release timing is the major focus of the distributors. In average, they can reap as high as 40% of the revenue in the opening week (Einav, 2007). Movie distributors prefer to release their movies during the peak holiday seasons, especially summer and Christmas. These are the times when consumers have more free time and likely to go to the movies. Nevertheless, there is fierce competition among distributors for these peak times, because the movie sales in these holiday weeks are the highest, compared other non-holiday weeks. Thus, the strong seasonal effects in demand will be faced through the movie's run (Moul & Shugan, 2005). Moreover, not only they have to consider the demand side, but also supply side of movies (theatres), due to a limited number of screens (Eliashberg et al., 2008). Krider and Weinberg (1998) revealed that distributors often avoid direct competition by not releasing competing movies during the same period. To avoid such competition, they will announce the movie's release date early (Einav, 2007). The reasons to why release timing is important are to get the best timing and optimal screen numbers before the competitors do.

A forecasting tool that able to capture the seasonality and generate reliable forecasts can be relied on, such as exponential smoothing methods. Exponential smoothing methods are popular in various industries because of their simplicity in the formulation and generate reliable forecasts (Gardner, 1985). Evidence in empirical studies has proven the impressive performance of exponential smoothing methods (Gardner, 2006). In the survey of sales forecasting practitioners, there is a high level of satisfaction towards the performance of exponential smoothing than any other method used (McCarthy et al., 2006). Another reason leads to their popularity is the forecasting accuracy that can be obtained with minimal effort in the application (Gardner, 1985). For instance, although exponential smoothing and Box-Jenkins

approach (ARMA) have little difference in accuracy, Box-Jenkins required the most time in the application (5 steps). Whenever there are new data, this approach would have to start the 5 steps over again. However, the estimation of parameters and forecasts generated by exponential smoothing are completely run on an automatic basis without human interference, even with new data. So, this method tends to shorten the time to make the decision of release timing.

The forecasts generated by exponential smoothing were expected to give a general picture of the future movie demand at the aggregate market level. However, there is limited literature regarding the application of exponential smoothing methods in movie demand forecasting.

1.2.2 Individual Movie (Qualitative)

Despite the performance of previous models, the problem of forecasting the demand of new movies especially before the release still remains in the industry due to less explanatory variables and data to support (Sharda & Delen, 2006). A number of studies showed that the forecasting error prior the movie release is large and decreasing gradually with data points (e.g. Sawhney & Eliashberg, 1996; Dellarocas et al., 2007; Lee, Kim, & Cha, 2012; Kim et al., 2015). Even though some models were being introduced to improve the forecasting prior the movie release, for example, proposed model by Neelamegham and Chintagunta (1999) and MOVIEMOD model by Eliashberg et al. (2000), these studies are not thorough. The results are only based on country-movie level and one movie respectively.

Even market-leading company Disney faced with the challenges of new product forecasting. The Lone Ranger is expected to turn into another series just like Pirates of the Caribbean, which grossed over US$ 3 billion worldwide. Before the launching of the movie, BoxOffice.com predicted that the sales revenues of US$ 37 million will be achieved over the opening weekend. A worldwide total of US$ 312 million were expected by Box Office and Film News. However, the actual sales during the opening weekend were US$ 29.3 million, and after a month of its release, the film had earned a total of US$ 175.4 million in worldwide sales. The New York Times estimated that the film has cost US$ 375 million to produce and market. Moreover, after accounting for revenue splits with theatre owners, it would need to earn an estimated US$ 800 million worldwide to break even. Walt Disney Studios Motion Pictures' vice president Dave Hollis claimed that the results "very disappointing" (Fritz, 2013, pB1).

The abovementioned issues revealed the risky environment in the motion picture business because the movie outcomes are unpredictable (Lovallo, Clarke, & Camerer, 2012). Accurately forecasting a movie's performance before its theatrical launch has challenged researchers for almost three decades (Sawhney & Eliashberg, 1996; Shugan & Swait, 2000; Simonoff & Sparrow, 2000). Even though after the official release of the movies, there are fewer data points to support the statistical analysis that required a large amount of data. There is a need to include intuitive judgement,

especially in demand forecasting of new movies (Eliashberg, et al., 2009). Kahn (2014) also stated that new product forecasting features little to no data. Thus, under this minimal data situation, a qualitative approach is required, with judgement and intuition as inputs in forecasts. Even authors (Eliashberg, et al., 2009; Kahn, 2014) had suggested using judgemental methods in demand forecasting, there is no motion picture study using such a method. There is a necessity to explore the usefulness of the judgemental method in movie demand forecasting under uncertain environment.

Unlike the exponential smoothing study, this judgemental study focused on demand forecasts of the individual movie. The forecasts generated were not based on time series data. It was based purely on the judgement of panel members regarding the expected sales of the individual movie.

1.3 Research Questions

1.3.1 Quantitative Study (Aggregate Market)

The purpose of this study was to gain insight into the usefulness of the newly proposed exponential smoothing method in movie demand forecasting. The research questions that guided this study are:

(a) Does total and split exponential smoothing method lead to greater accuracy as compared to other traditional exponential smoothing methods?
(b) Does using the sum of absolute error (SAE) criterion in model-fitting contribute to better forecasting accuracy as compared to the sum of squared error criterion (SSE)?

1.3.2 Qualitative Study (Individual Movie)

The purpose of this study was to gain insight into the usefulness of the judgemental method in movie demand forecasting. The research questions that guided this study are:

(a) Does group estimates lead to greater accuracy as compared to individual estimates in movie demand forecasting with the Delphi method?
(b) Do Delphi rounds lead to an improvement in accuracy of movie demand forecasting when there are feedback and contextual information?
(c) Does the judgemental method (Delphi) lead to greater accuracy as compared to the statistical method (simple exponential smoothing) in movie demand forecasting under the condition of limited information?
(d) Do combined forecasts lead to greater accuracy as compared to individual forecasts (judgemental forecasts and statistical forecasts) in movie demand forecasting under great uncertainty?

1.4 Research Objectives

1.4.1 Quantitative Study (Aggregate Market)

The scope of this quantitative study is defined in the following objectives:

1. To compare the accuracy of the newly proposed method by Taylor (2007), total and split exponential smoothing method and other exponential smoothing methods in movie demand forecasting.
2. To evaluate the forecasting accuracy of model-fitting criterion with the sum of absolute errors (SAE) and the sum of squared errors (SSE).

1.4.2 Qualitative Study (Individual Movie)

The scope of this qualitative study is defined in the following objectives:

1. To compare the accuracy of the group and individual estimates with the Delphi method in movie demand forecasting.
2. To evaluate the improvement in accuracy of judgemental forecasts over the Delphi rounds when there are feedback and contextual information.
3. To compare the accuracy of the judgemental method (Delphi) and statistical method (simple exponential smoothing) in movie demand forecasting.
4. To evaluate the accuracy of combined forecasts and compare to individual forecasts (judgemental forecasts and statistical forecasts).

1.5 Significance of Study

This study contributed to the exposure of usefulness of newly proposed exponential smoothing method and judgemental technique in movie demand forecasting.

In the past research, exponential smoothing is a popular method in the industry especially in inventory control, due to their simplicity and reliable forecast (Gardner, 1985). We intend to investigate whether the total and split exponential smoothing performed better than traditional methods and which model-fitting criterion would generate better forecasting accuracy. The findings of the study allowed the identification of the best method to model the historical patterns and demand for movie sales and forecast ahead. The outcomes also gave a general picture of the future movie demand and help distributors in deciding the best release dates earlier.

The minimal data and uncertainty of new movie demand encourage the application of judgemental approaches (Kahn, 2014). Since there is limited literature of judgemental methods in movie demand forecasting, the findings of this study considered to

investigate the benefits of Delphi method under the condition of uncertainty. Even it is just simple employment of the Delphi method, at least the benefits and procedures of the method were shares among the researchers and industry players. Moreover, the forecasting was done at individual movie level, so, it was made based on the uniqueness of each movie. For researchers, it encourages them to studies more on this area under different conditions and variables using this Delphi method. In addition, there is limited literature regarding the combination of Delphi and exponential smoothing forecasts. For motion picture industry players (distributors and exhibitors), the results give them the confidence to apply this method, even though time-consuming. They will identify a new way to forecast the new movie demand rather than relying only on statistical methods, since the forecasts are important in making managerial decisions, be it before and after the movie release.

1.6 Terminology of Definition

The following sections were the important terms and their definition.

1.6.1 Forecasting

The forecast is a prediction or estimate of actual value in the future time period for time series or for another situation. Forecasting is estimating in unknown situations. The word forecasting and predicting are used interchangeably (Armstrong, 2001). In our study, we use the time series method and judgemental method in movie demand forecasting which characterised as great uncertainty.

1.6.2 Movie

Based on film glossary, another term of the movie is known as motion pictures. It defined as a length of the film (with or without sound) with a sequence of images that create an illusion of movement when projected. Movies considered as experiential products because of individual use movies merely for experience and enjoyment (Hirschman & Holbrook, 1982; Holbrook & Hirschman, 1982). Moreover, they do not know the true value of the movie until they experience it (Shapiro & Varian, 1999).

1.6.3 Demand

The definition of demand is the need for a certain product or component (Armstrong, 2001). Usually, demand data is different from sales data. It was believed that demand does not necessarily lead to sales. However, in the motion picture industry, demand and sales were the same things. Past literature that focuses on estimating the demand for movies used box office sales to make their movie demand forecasts (Sawhney & Eliashberg, 1996; Eliashberg & Shugan, 1997; Einav, 2007).

1.6.4 Composite Forecasts

The composite or combined forecast is the process of using different forecasts to produce another forecast. Combining is inexpensive and expected to improve forecast accuracy. It is believed that it helps to protect against large errors (Armstrong, 2001). The composite forecasts obtained with a simple average of Delphi and exponential smoothing forecasts.

1.7 Conceptual Framework

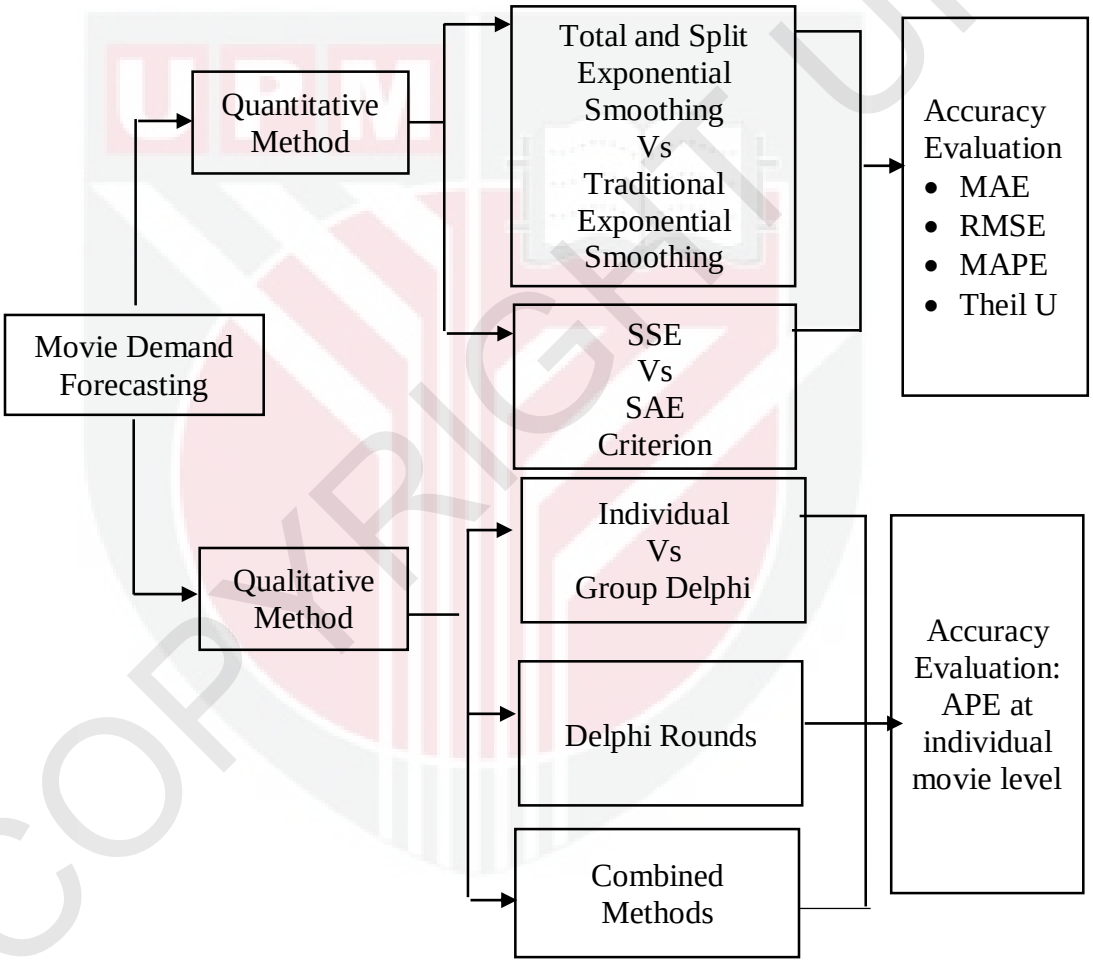

Diagram 1.1 : Conceptual framework of forecasting in movie demand

1.8 Summary

Two different studies have been carried out, quantitative and qualitative studies. The quantitative study focused on the application of exponential smoothing methods in daily movie sales series. The qualitative study concerned the application of the Delphi method in demand forecasting at individual movie level.

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