RETAIL STORE PERFORMANCE ASSESSMENT

THROUGH SUPPLY CHAIN PERSPECTIVE

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RETAIL STORE PERFORMANCE ASSESSMENT THROUGH SUPPLY CHAIN PERSPECTIVE

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ABSTRACT

RETAIL STORE PERFORMANCE ASSESSMENT THROUGH SUPPLY CHAIN PERSPECTIVE

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Regardless of the industry, performance assessment is vital for firms. Especially, in the retailing industry, the competition is fierce than ever. The role of global retailers is evident in this. With the impact of globalization, the power and market share of global retailers have altered accordingly. Hence, using proper performance measurement methods and managing the resources and outputs in accordance with performance results, are vital for companies. This study provides comprehensive analysis of performance measurement of retail stores that belongs to a global retail chain operating in food retailing. The research analysed 33 retail stores through weekly

collected data from March 2009 – March 2010. Data Envelopment Analysis and statistical analyses were conducted to measure the performance of retail stores, to explain the interaction between inputs and outputs, to explain the variance change in selected dependent variables and to provide theoretical background for supply chain perspective through the usage of Resource Based Theory. This thesis develops a new retail store performance measurement model that is empirically supported. Additionally, it provides theoretical background for supply chain perspective in retail store performance measurement.

To verify the validity of the proposed conceptual model, this study utilizes real company data. Consequently, the results are consistent with the theoretical background while providing deeper managerial implications. The study contributes to theory and practice through the usage supply chain perspective in retail store performance assessment.

Key words: retail store performance, retailing, Data Envelopment Analysis, supply chain perspective

ÖZET

TEDARİK ZİNCİRİ PERSPEKTİFİYLE PERAKENDE MAĞAZA PERFORMANSININ DEĞERLENDİRİLMESİ

YUMURTACI, Işık Özge

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Performans değerlendirmesi faaliyet gösterilen sektörden bağımsız olarak, her firma için önem arz etmektedir. Özellikle, perakende sektöründe rekabet etmek oldukça zorludur. Küresel perakendecilerin belirgin bir şekilde rekabetin zorlu olmasında payları vardır. Öyle ki, küreselleşmenin etkisiyle küresel perakendecilerin gücü ve pazar payları değişmiştir. Bu nedenle, uygun performans ölçüm yöntemleri kullanmak, kaynak ve çıktıları performans sonuçlarına göre yönetmek perakendeciler için oldukça önemlidir. Bu çalışmada, gıda perakendeciliğinde faaliyet gösteren küresel bir perakendecinin, perakende mağaza performans ölçümü detaylı bir şekilde incelenmiştir. Çalışmanın analiz kısmında, 33 perakende mağazasının performans ölçümü Mart 2009 – Mart 2010 aralığındaki 52 haftalık süre için yapılmıştır. Bu çalışmada, ilgili perakende mağazalarının performans ölçümünü yapabilmek,

performans ölçümünde kullanılan girdi ve çıktılar arasındaki etkileşimi ortaya koyabilmek, seçilen bağımlı değişkenlerdeki varyans değişimlerini açıklayabilmek ve perakende mağaza performansının değerlendirilmesinde kaynak taban teorisi kullanımıyla tedarik zinciri perspektifini oluşturacak teorik altyapıyı sağlayabilmek için Veri Zarflama Analizi ve istatistiksel analizlerden yararlanılmıştır. Tez kapsamında, perakende mağaza ölçümünde kullanılabilecek yeni bir model geliştirilmiştir.

Çalışma dahilinde kullanılan veriler gerçek firma verisidir. Sonuç olarak, bulunan analiz sonuçları teorik çerçeveyle uygunluk göstermekte ve yönetimsel çıkarımlar sağlanmaktadır. Bu çalışma, perakende mağazası performans değerlendirmesinde tedarik zinciri perspektifi yaklaşımı kullanmasıyla teoriye ve pratiğe katkı sağlamıştır.

Anahtar Kelimeler: perakende mağaza performansı, perakendecilik, veri zarflama analizi, tedarik zinciri perspektifi

To my parents

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Işık Özge Yumurtacı

Izmir, June 2011

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LIST OF ABBREVIATIONS

BCC: Banker-Charnes-Cooper

CCR: Charnes-Cooper-Rhodes

CPFR: Collaborative Planning Forecasting and Replenishment

CRS: Constant Returns to Scale

DEA: Data Envelopment Analysis

DMU: Decision Making Unit

ECR: Efficient Consumer Response

FTE: Full Time Equivalent

GMIS: General Merchandise Information System

QR: Quick Response

RBT: Resource Based Theory

SCM: Supply Chain Management

SCF: Stochastic Cost Frontier Analysis (SCF)

SKU: Stock Keeping Unit

VRS: Variable Returns to Scale

CHAPTER 1

INTRODUCTION

1.1. Introduction of the Main Concepts and General Aims of the Study

In today's global business, competition between companies and countries is continually increasing. During the last decades, reducing costs and increasing the performance of business operations have been the main tools for competing and surviving in business environment. Regarding these reasons, the evolution of logistics and supply chain management (SCM) disciplines have served to provide theoretical and managerial insight not only to academicians but also to practitioners. In this, benefits of SCM have played a vital role. Basically, the benefits of SCM covers inventory reduction, improved delivery service and shorter product development cycles (Fawcett et al., 2008). SCM aims at reducing and eliminating uncertainties in order to improve the performance of the chain (Van Der Vorst et al., 1998). Although literature highlights many significant points in the field, practice differs from recommended SCM approaches. For instance, Deloitte Consulting reported an interesting research result. Although 91% of North American manufacturers considered SCM as a significant or vital approach to organizational success, only 2% of North American manufacturers could position their supply chains as world class (Shepherd and Günter, 2006). It can be inferred that, although firms consider SCM as an important competition weapon, they are unable to manage their supply chains at the desired level. It should be noted that it is not an easy process to position any supply chain as world class. Firstly, companies should be

aware of supply chain knowledge and understanding. Secondly, they should firmly believe in the benefits of SCM. Additionally, they should be ready to deal with today's business challenges. Among the main challenges, performance measurement in all business functions clearly stands out.

It is a common understanding that performance measurement and management are vital for each company regardless of the industry they are operating in. Hence, performance measurement has become an important research topic not only in the field of SCM but also in other fields such as management since 1990s. In literature, performance measurement studies provided frameworks and various metrics to enable companies more effectively manage resources and outcomes. Although early studies of performance measurement was used to assess the performance of employees, nowadays performance measurement of each asset inside companies has become crucial. This research trend has also impacted the field of SCM. However, studies held in supply chain performance measurement have tended to provide more theoretical implications than managerial insight.

Although some firms have recognized the importance of SCM, they often lack the perspective to develop the effective performance measures necessary to accomplish an integrated supply chain structure (Gunasekaran, et al. 2001). Lambert and Pohlen (2001) state that "most of the performance measures called supply chain metrics are nothing more than logistics measures that have an internal focus. These measures may actually prove to be dysfunctional by attempting to optimize firm's performance at the expense of the other firms in the supply chain."

This observation clearly shows the need for a classification of the performance measures that takes into consideration the supply chain perspective. Although research on supply chain performance measurement and management is vast, the perspective of SCM, and especially empirical research with supply chain point of view is limited (Cuthberston and Piotrowicz, 2008). Hence, this study aims to highlight the lack of research on performance measurement and management through supply chain point of view. Up to now, performance measurement and management studies have been held in the various industries, however research in retailing industry emphasizing supply chain perspective is limited. To fulfill this aim, retailing industry has been chosen as the industry that the empirical analysis will be conducted. It is well known due to the many types of retailers, care should be taken when choosing the retailer for research. In this sense, the researcher chose a global supply chain that operates mainly in food category, operating in two different retail formats, hypermarkets and express stores. Because of the availability of data relating only to hypermarkets, this was the analysis unit chosen. Due to the confidentiality agreement, the name of the retailer will not be declared. However, it can be noted that the retailer analyzed is a global retail chain that also operates in Turkish market.

The underlying reason for selecting the retailing industry can also be supported with some statistics. As a primary driver of the global economy, the total sales generated by the world's ten largest retail companies were $ 978.5 billion in 2007 (http://retailindustry.about.com/od/statisticsresearch/p/retailindustry.htm).

Considering the fact that retailing is amongst one of the most diverse and dynamic industries tendering ever increasing range of goods and services (Jones et al., 2005), there has been an increasing need to conduct research in this industry, in which rivals

use similar resources to operate at desired service levels. Therefore, providing sustainable competitive advantage in this industry is challenging. The increasing competition forces retailers to seeking ways to enhance performance (Gorsten and Gruen, 2003). Peterson and Balasubramanian (2002) report the need for improved retail performance metrics as a field that needs further research in the future.

Although performance of retailers is significant, it is essential to note that performance of chain members in the retail industry is strongly dependent on unit level performance (Gaur et al., 2005), such as performance of suppliers, distribution centre, manufacturers and retail stores. In the retailing industry, where physical stores are used for displaying and selling items, retail stores are the final chain unit that provides goods and services to the end user. Hence, the performance of retail stores is a key indicator in the assessment of the retailer's performance. However, ratio-based individual performance indicators can not sufficiently reflect supply chain point of view. Therefore, performance of retail stores should be measured from a supply chain point of view, using multiple inputs and outputs simultaneously.

As discussed above, there is a need for retail store performance measurement model that emphasizes supply chain perspective. In order to provide a deeper understanding, the association between inputs and outputs are examined specifically. On the other hand, research in the retailing industry that considers related theories emphasizing supply chain perspective is limited. Therefore, this thesis also aims to provide theoretical background in retailing industry with supply chain point of view. In order to fulfill these aims, a weekly analysis of retail stores' performance and statistical analysis to support findings will be conducted. This thesis is also a

pioneering study that uses weekly analysis to provide theoretical and managerial insight. By fulfilling all of these aims, this study will also contribute to supply chain and retailing literature.

1.2. Significance of the Study

Among the main aims of this study, the provision of a new model to measure retail store performance measurement clearly stands out. By fulfilling this aim, the study will provide significant contributions to theory as well as provide useful information to practitioners. The theoretical contribution of this thesis is based on using new inputs and outputs that were not studied before, and providing a theoretical ground emphasizing supply chain perspective in retail store performance measurement. From managerial point of view, using a holistic performance measurement model that simultaneously considers multiple inputs and outputs is beneficial for assessing retail store performance. Another significant point of this study is based on using real company data and providing managerial implications through real data. Not only in Turkey but also in other countries performing research using real company data, although difficult to access, is advantageous for the researcher.

In addition, providing weekly analysis results brings advantages to ground supply chain related theories in retailing and provides greater managerial insight by displaying the performance of retail stores in timely manner. The findings of the study may provide new insight to provide greater awareness of the supply chain perspective when assessing retail store performance measurement. This is important

for practitioners employed in retail industry who keep record of various data, but often do not use them holistically.

Moreover, this study is the first attempt to provide weekly analysis results on annual basis by using Data Envelopment Analysis (DEA) in retailing. Findings will provide practitioners with a new model for assessing retail store performance from supply chain perspective. Regarding the analysis results, interaction and association between inputs and outputs will be revealed. Furthermore, in line with other studies, this study is expected to provide important findings and theoretical background for further research that will be held in retailing industry. Further research in this field will be appreciated especially, as retailing industry in Turkey increases its market share.

1.3. A Priori Research Model

It is helpful for the researcher to form a priori research model in the design stage of the research. Therefore, in this section, a priori research model will be presented. While the methodology of this thesis is based on using DEA and applying the proper statistical analysis, a priori research model that forms the main basis of analysis with DEA is displayed. The other models that are used to answer research questions three, four and five will be presented in the related sections.

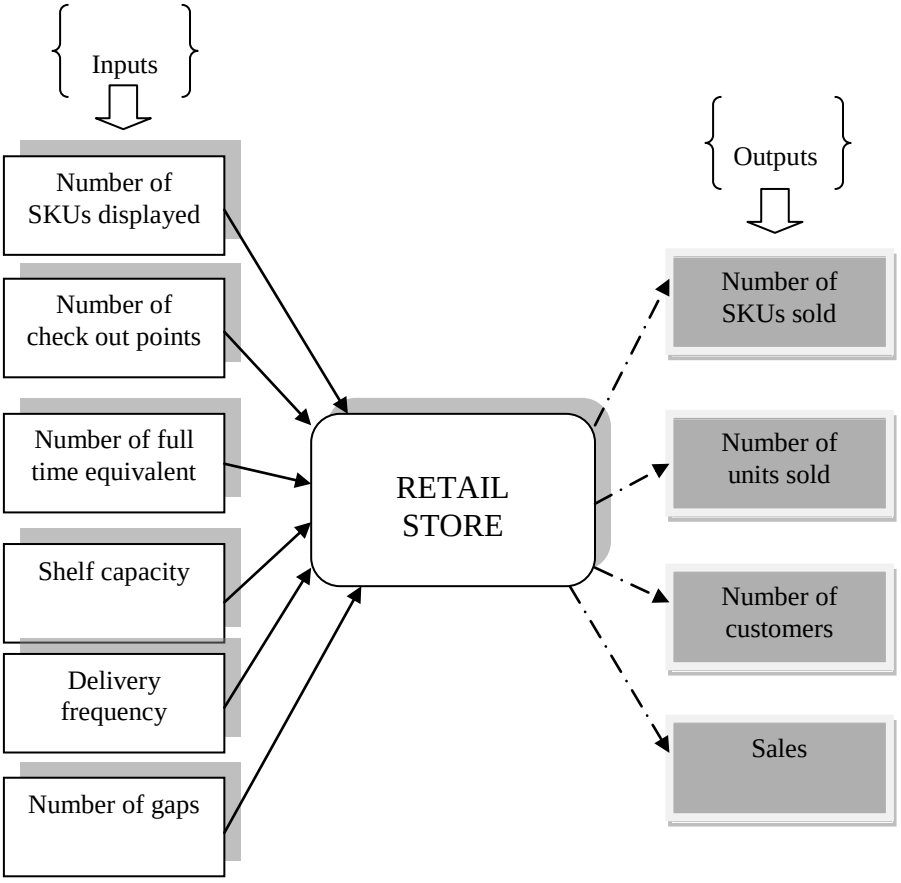

Figure 1 A Priori Research Model for Data Envelopment Analysis (DEA) to Measure Retail Store Performance

Regarding the following sections of the study, it is important to note that in the analysis inputs are evaluated as resources for generating the related outputs. Performance of retail stores is measured through the simultaneous usage of inputs and outputs.

1.4. Research Questions

Research questions play vital role in fulfilling the aims of the study. Taking into consideration the aims of this thesis, the study focuses on the following research questions:

Research question 1: Can retail store performance be measured by number of Stock Keeping Units (SKU) displayed, number of check out points, number of full time equivalent personnel (FTE), shelf capacity, delivery frequency, number of gaps, number of SKUs sold, number of units sold, number of customers and sales?

Research question 2: Can resource based theory (RBT) be used in assessing retail store performance measurement results?

Research question 3: To what extent are inputs used in retail store performance measurement related to outputs?

Research question 4: Can the number of SKUs sold be predicted by the following variables: population within a 5 km radius, delivery frequency, number of SKUs displayed, shelf capacity and number of FTE?

Research question 5: Can sales be predicted by the following variables: population within a 5 km radius, delivery frequency, number of SKUs displayed, shelf capacity and number of units sold?

Research question 6: Does weekly analysis provide comprehensive managerial and theoretical insights?

1.5. Structure of the Thesis

As discussed in the introduction of the main concepts part, the main research conducted in this thesis focuses on the retailing industry, assessing stores as the main analysis unit. In addition, this thesis aims to develop a new performance measurement model that emphasizes the supply chain point of view. In accordance with the above mentioned content, Chapter 2 provides in depth examination of retailing through its evolution and concept. Furthermore, the retailing industry in Turkey, global retail chains that operate in Turkish market, and the interdisciplinary approach in retailing are discussed.

The third chapter provides a comprehensive literature review on retail store performance measurement incorporating content analysis, and discusses supply chain perspective through different theories.

In the fourth chapter, methodology of the thesis with Data Envelopment Analysis (DEA) and statistical analysis are explained. Additionally, research design and inputs and outputs selection for analysis are discussed, while the fifth chapter includes results that are obtained with DEA and statistical analysis.

Lastly, the sixth chapter discusses theoretical contribution and managerial implications, while research limitations are also considered. Additionally, suggestion for further research and conclusion are provided.

CHAPTER 2

RETAILING INDUSTRY

2.1. What is Retailing?

The word retailer originates from tailor – one who cuts into pieces; a term that refers to the breaking down of bulk function performed in marketing channels (Mulhern, 1997). In the past, retailing has been considered as an industry that enables sale of goods to the consumer through retail shops, however retailing involves not only the sales of goods but also sales of services (Cox and Brittain, 2004). Thus, retailing deals with more than selling goods. By its nature, retailing firms are everywhere and play an important role in our daily life. In this sense, classification of retail firms is significant to differentiate the types of retailers.

According to Cox and Brittain (2004), the classification of retail firms can be stated as follows: independent traders, multiple or chain stores, cooperative societies, department stores, discount stores, superstores, hypermarkets and franchising. Apart from this, there are also other forms of retail firms such as markets, mobile shops, automatic vending, door-to-door trading, party selling, club trading and e-tailing. Additionally, wholesale organizations play significant role in retailing industry where cash and carry wholesalers are very common in each retail market. As stated before, hypermarkets have been chosen as the focus of this study, and it is emphasized again that the scope of retailing research differs in accordance with the type of retailers.

Here, it is useful to discuss the content of retailing research, which has been considered as marketing research within the retailing context (Cox and Brittain, 2004). Although valid, this point of view remains limited for serving the needs of contemporary retailing industry. This situation is also highlighted by the recent studies, according to Peterson and Balasubramanian (2002), development of comprehensive theories on systematically directed retailing practices, strategy generation and more empirical research in retailing are needed. Although these points emphasize issues for further development in retailing research, there is a more fundamental problem in the field, there is no commonly accepted definition of retailing, due to its complicated and dispersed structure. Hence, discussing the concept of retailing is a challenging issue. However, examining definition(s) of retailing can help clarify discussions on the concept. In the following table, some of the definitions of retailing will be displayed.

Table 1 Selected Definitions of Retailing

(James et al. 1981, p.5)	**"**All the activities associated with the sale of offerings for final consumption."
(Morgenstein and Strongin, 1983, p.6)	**"**Consists of the selling of goods and services to their ultimate consumers, that is, individuals who buy something for personal or household use."
(Mason et al. 1991, p.5)	**"**Consists of all activities involved in the sale of goods and services to the ultimate consumer."
(Burstiner 1991, p.741)	"Form of distribution that involves selling goods and services to consumers to fill their needs and wants; all the activities that must take place before the retailer can sell the goods (services); and including an exchange process between consumer and retailer."

Table 1 (Continuing)

(Baron et al. 1991, p.193)	"Process of selling goods and services to ultimate consumers, or those buying on behalf of such consumers, particularly when carried out through store outlets and, when further specified, mail order, etc."
(Rosenberg, 1993, p.291)	"The activity of purchasing for resale to a customer."
(Lucas et al. 1994, p.612)	**"**All activities involved in the marketing of goods and services directly to consumers."
(Caruth and Stovall,1994)	"The activities involved in selling goods or services to ultimate consumers who purchase them for personal or household use."
(Bennett 1995, p.245)	"A set of business activities carried on to accomplishing the exchange of goods and services for purposes of personal, family or household use, whether performed in as store or by some form of nonstore selling."
(Cross 1995, p.312)	"The promoting and selling of merchandise directly to consumers, augmented by advertising, store promotions, and personal contacts in the community where the retailer's outlet is located. Retailing is the selling of finished goods and service to the consumer for personal or family consumption. It includes store retailing, such as department stores, nonstore retailing, such as direct selling and mail order, or service retailing, such as dry cleaning."
(Levy and Weitz, 1996, p.419)	**"**The set of business activities involved in selling products and services to ultimate consumers."
(Dunne and Lusch, 1999, p.5)	**"**Consists of the final activity and steps needed to place merchandise made elsewhere in the hands of the consumer or to provide services to the consumer."
(Berman and Evans, 2001, p.28)	"Business activities involved in selling goods and services to consumers for their personal, family or household use."

Source: Peterson and Balasubramanian (2002)

Among these definitions, Levy and Weitz (1996) emphasize that retailing is "the set of business activities involved in selling products and services to ultimate consumers". In light of the definition, it is highlighted that, the set of business activities are important to provide goods and services to ultimate consumers. Supply chain management has significant role to provide goods and services to ultimate consumers, while it involves the integration of key business processes from end user through original suppliers that provides products, services, and information (Lambert, 2008).

Although there exists many definitions of retailing, a "new" definition of retailing is needed (Peterson and Balasubramanian, 2002). Regarding this need, the "new" definition of retailing should reflect supply chain perspective and identify the related supply chain activities in retailing. This is because of the rising importance and role of supply chain management in retailing industry. In this sense, a new definition to reflect this perspective, "retail supply chain management" is proposed as follows:

> *Retail supply chain management is concerned with the design, planning, sourcing, control and monitoring of retail activities involving demand forecasting, merchandise and product assortment planning, pricing, promotions, store location and design with the special focus on-shelf availability, retail communication, advertising, promotion and pricing in order to provide profitability, customer loyalty through customer satisfaction.*

After reviewing the content of retailing and its definitions in literature, it is useful to state the evolution and scope of retailing to provide deeper understanding. Therefore, in the next section the evolution and scope of retailing are discussed in detail.

2.2. The Evolution and Scope of Retailing

The retailing industry started to attract attention since the mid of 19th century, when goods were first displayed in big exhibition areas. At the beginning of the 20th century chain stores emerged in the retailing industry.

The main reason behind the development of chain stores is due to changing structure of demographic characteristics of the habitants (Cengiz and Ozden, 2003). U.S.A is considered one of the leading countries in the development of retailing industry, where the first supermarkets in the world were opened in 1930s and where the number of supermarkets increased dramatically in 1950s.

At the same time period, the rising immigration changed consumption patterns in Europe as well. Hence retailing industry in Europe faced dramatic development. For instance, France was the first country to use large scale distribution. It is essential to note that, nowadays France is experiencing the maturity stage in its retailing industry (Arasta, 1999). On the other hand, retailing industry in Germany grew dramatically through globalization impacts. It is also important to emphasize the developed structure of retailing industry in United Kingdom which has the most developed retailing industry structure, and holds the highest share from European Retailing Industry (Arasta, 1999).

One of the earlier studies in evolution of retailing was conducted by Dreesmann (1968), who suggests theories related to patterns of evolution in retailing. Dreesmann's view is highlighted with a modern perspective in Cox and Brittain's (2004) research, who believe that theories of retail change can be explained through natural selection in retailing (Darwin's biological theory of natural selection has been adopted to "retail types or units"), the wheel of retailing (highlights that an efficient innovatory form of retailing, such as discounting, enters to markets and attracts the attention by its new appeal), accordion theory (the tendency for retail business to become dominated by generalists, then specialists and then generalists again) and the retail life cycle (stages of innovation, growth, maturity and final decline).

It is foreseen that retailing in the 21st century will be very different from retailing in the 20th century just as retailing in the 20th century was very different compared to the previous century (Peterson and Balasubramanian, 2002). This situation is in accordance with the theories related to patterns of evolution of retailing (e.g. theory of natural selection, retail life cycle). The retailing industry in the world is dominated by global players whose aim is to expand their business through new markets.

The retailing industry all around the world experiences different life cycle stages and regarding to this evolution of retailing industry alters according to country and retailer types. As stated before, the power of multinational retailers has increased during the last decades. This view can be supported with statistics: according to a latest report published by Deloitte (Global Powers of Retailing 2011), combined retail sales of the Top 250 retailers totaled $ 3.76 trillion in 2009, down slightly from

nearly $ 3.82 trillion recorded by 2008's Top 250 retailers. In order to provide more insight about the top 250 retailers in the world, the following table is presented.

Table 2 Quick Statistics of Top 250 Retailers.

Top 250 Retailers Quick Statistics, 2009
• $ 3.76 trillion- aggregate sales of Top 250 retailers in US$
• $ 15.05 billion- average size of Top 250 retailers
• $ 3.075 billion- minimum sales required to be on 250 list
• 1.3% – composite year-over-year retail sales growth
• 6.1 %– 2004-2009 composite compound annual growth rate in sales
• 3.1% – composite net profit margin
• 4.9% percent - composite return on assets

Source: Deloitte, Global Powers of Retailing (2011)

With the globalization impact, the power and market share of global retailers have altered accordingly. According to a report published by Deloitte entitled "Global Powers of Retailing" (2011), the revenue of super power retailers is more than $ 3 trillion. The dynamic retailing environment and changing structure of retail trends enable global retailers to enhance their revenue.

As stated before, retail trends change frequently in accordance with consumption patterns. Among the latest retail trends, focus on changing consumer behavior, luxury tendency, world-class emerging retailers, acceleration of globalized U.S retailers, the impact of social networking on retailing, rationalizing assortments and increased polarization of product categories clearly stand out (Deloitte, 2010).

However, the reflections of these retail trends change according to types of retailers or retail formats. Types of retailers are department stores, drugstores, variety stores, supermarkets, and other types of retailing that constitute different homogeneous categories (Dreesmann, 1968). This classification reflects the retailing structure in the 1960s. Currently, retailers are classified (according to product sector) as fast-moving consumer goods, fashion goods retailers, hardlines&leisure goods retailers, and diversified retailers (Deloitte, 2010). Among these, fast-moving consumer goods retailers rank 1st in terms of retail sales. Therefore, the top 10 retailers in the world, as shown in Table 3, are the Top 10 retailers in fast-moving consumer goods.

Table 3 Top 10 Retailers by Product Sector, 2009

Sector Rank	**Top 250 Rank**	**Company**	**Retail Sales (U.S.$ mill)**	**Country of Origin**
1	1	Wal-Mart	$ 405.046	U.S.A
2	2	Carrefour	$ 119.887	France
3	4	Tesco	$ 90.435	U.K.
4	5	Schwarz	$77.221	Germany
6	8	Costco	$ 69.889	U.S.A
7	9	Aldi	$ 67.709	Germany
8	11	Walgreens	$ 63.335	U.S.A
9	12	Rewe	$ 61.771	Germany
10	13	CVS Caremark	$ 55.355	U.S.A

Source: Deloitte (2010)

In addition, it is useful to evaluate the global retail sales value over a period of time. Table 4 presents retail sales, retail growth rate, online sales and online growth date between 2005 -2009.

Table 4 Global Retail Sales

	2005	2006	2007	2008	2009
Retail Sales (USD Billion)	11,100	11,900	13,200	14,500	13,900
Retail (Growth Rate)	-	7.2%	10.9%	9.8%	-4.1%
Online Sales (USD Billion)	181	222	271	304	349
Online Growth Rate	-	22.7%	22.1%	12.4%	14.5%

Source:http://www.imap.com/imap/media/resources/IMAPRetailReport8_23CB9AA9C6EBB.pdf , IMAD Global Retail Report (2010)

The evolution of retailing industry can also be assessed by retail globalization approach. According to IMAD Global Retail Report (2010), among developed countries, the UK maintains its leading position as the most international retail market. Europe maintained its capacity to attract the world's top retailers in 2009, with 58% of the world's top 250 retailers having a presence in Europe. The UK performed better than other major European economies such as Spain, France, Germany and Italy, ranking first among the top 15 most international retail markets.

European retailers are more open to globalization than American retailers because they face strict restrictions on development in their home markets. For instance, French companies cannot easily establish new hypermarkets in their home markets, due to regulations.

As a result of these, they have to expand their business in other markets. This is why the high share of global retailers is based in Europe. The US retail industry was in 10th rank in terms of the existence of retailers that are originally not U.S., with 39% of international retailers. Compared to European retailers, US retailers choose to penetrate their own vast national market extensively before considering international expansion. Europe continues to control retail globalization, by showing existence in eight out of the top 15 most international retail locations; however, emerging economies such as China, Russia and the United Arab Emirates have gained significant ground in the recent past (IMAD, 2010). These economies will be leaders in providing revenue to global retailers in the near future.

Justification of this report's inferences is also highlighted in Deloitte's Hidden Heroes-Emerging Retail Markets beyond China report (2010), which states that, apart from China, countries which are considered emerging retail markets are Brazil, Colombia, Egypt, India, Indonesia, Mexico, Russia, South Africa, Vietnam and Turkey. It is expected that, in the coming years, emerging markets will determine the evolution of retailing, and seems as they will provide a superior market share compared to most of the current global retailers. More information on Top 10 retailers by region is presented Table 5 (2009): Europe, North America, Asia/Pacific, Latin America and Africa/Middle East respectively.

Table 5 Top 10 Retailers by region (2009)

Region-rank	Top 250 rank	Company	Retail sales (US$ mill)	Country of origin
EUROPE				
1	2	Carrefour	$ 119,887	France
2	3	Metro	$ 90,850	Germany
3	4	Tesco	$ 90,435	UK
4	5	Schwarz	$ 77,221	Germany
5	8	Aldi	$ 67,709	Germany
6	12	Rewe	$ 61,771	Germany
7	14	Edeka Zentrale	$55,339	Germany
8	15	Auchan	$ 54,057	France
9	22	E.Leclerc	$ 41,002	France
10	25	Ahold	$ 38,945	Netherlands
NORTH AMERICA				
1	1	Wal-Mart	$ 405,046	U.S.A
2	6	Kroger	$76,733	U.S.A
3	7	Costco	$ 69,889	U.S.A
4	9	Home Depot	$ 66,176	U.S.A
5	10	Target	$ 63, 435	U.S.A
6	11	Walgreens	$ 63,335	U.S.A
7	13	CVS Caremark	$ 55,355	U.S.A
8	17	Best Buy	$ 49,694	U.S.A
9	19	Lowe's	$ 47,220	U.S.A
10	21	Sears Holdings	$ 44,043	U.S.A
ASIA/PACIFIC				
1	16	Seven & I Holdings	$ 52,508	Japan

Table 5 (Continuing)

2	18	AEON	$ 49,021	Japan
3	20	Woolworths	$ 44,410	Australia
4	23	Wesfarmers	$ 40,288	Australia
5	37	Yamada Denki	$ 21,734	Japan
6	55	AS Watson	$ 14,977	Hong Kong
7	62	Isetan Mitsukoshi Holdings	$ 13,575	Japan
8	70	Bailian	$ 12,257	China
9	77	UNY	$ 11,785	Japan
10	83	Daiei	$ 10,295	Japan
LATIN AMERICA				
1	75	Grupo Pao de Acucar	$ 11,819	Brazil
2	90	Cencosud	$ 9,143	Chile
3	131	Casas Bahia	$ 6,608	Brazil
4	132	Soriana	$ 6,586	Mexico
5	150	Falabella	$ 5,644	Chile
6	184	Lojas Americanas	$ 4,236	Brazil
7	194	Comercial Mexicana	$ 4,012	Mexico
8	196	FEMSA Comercio	$ 3,979	Mexico
9	219	Comercial Chedraui	$ 3,522	Mexico
10	241	El Puerto de Liverpool	$ 3,130	Mexico
AFRICA/ MIDDLE EAST				
1	95	Shoprite Holdings	$ 8,823	South Africa
2	130	Pick ‘n Pay	$ 6,810	South Africa
3	138	Massmart	$ 6,274	South Africa
4	***206***	***Migros Ticaret***	***$ 3,691***	***Turkey***
5	211	SPAR	$ 3,627	South Africa

Table 5 (Continuing)

6	***220***	***BIM***	***$ 3,440***	***Turkey***
7	245	Metcash	$ 3,105	South Africa
8	248	Woolworths Holdings	$ 3,093	South Africa

Source: Deloitte Report (2011), Global Powers of Retailing

Regarding Table 5, two retailers from Turkey, BIM and Migros Ticaret, are in Top 10 Retailers list in Africa/Middle East region. The following section provides a detailed discussion of the situation in Turkey. Apart from evaluating top 10 retailers by region evaluating each region according to number of retailers in the top 250 list, their average retail sales and percentage of retail sales from foreign operations provide useful information on today's retail industry.

Table 6 Region/Country Profiles of Retailers

	Number of Companies	**Average 2009 Retail Sales (U.S. $ mil)**	**% Retail sales from Foreign Operations 2009**
Top 250*	250	$ 15,054	22.2%
Africa/ Middle East	8	$ 4,858	8.7%
Asia/Pacific	46	$ 10,267	10.5%
Japan	32	$ 9,254	6.9%
Europe	92	$ 16,507	36.5%
France	13	$ 28,620	41.3%
Germany	19	$ 23,046	41.6%
U.K.	15	$ 17,282	21.9%
Latin America	10	$ 5,868	12.0%
North America	94	$ 17,820	13.3%
U.S*	84	$ 18,851	13.3%

Results reflect Top 250 retailers headquartered in each region/country, * *average number of countries excludes Dell (U.S), whose near-global coverage would skew the average
Source: Published company data and Planet Retail cited in Deloitte "Leaving Home Global Powers of Retailing" (2011)

According to Table 6, Germany, France and UK receive a high share from their global operations, whereas Africa/ Middle East region has the lowest share from global operations, and their presence in the top 250 retailers remains limited. However, it is foreseen that the share of some specific regions, such as Africa/Middle East will increase in the near future. In this sense, not only European retailers but also US retailers will seek for new markets to expand their market share, a trend which can be observed with the tension caused by their aggressive entry of global retailers into new markets. This situation can also be monitored in Turkey. The changing structure of Turkish retailing industry will be discussed in the following parts in detail.

Although evolution of retailing provides useful information on the changing market share of retailing industry all around the world, it is also necessary to discuss the scope of retailing to understand the interdisciplinary approach in retailing.

In this sense, the scope of retailing can be discussed with the following definition of retailing (Cross 1995, p.312): *"The promoting and selling of merchandise directly to consumers, augmented by advertising, store promotions, and personal contacts in the community where the retailer's outlet is located. Retailing is the selling of finished goods and service to the consumer for personal or family consumption. It includes store retailing, such as department stores, nonstore retailing, such as direct selling and mail order, or service retailing, such as dry cleaning".* Regarding this definition, the scope of retailing and retail management deals not only with marketing,

manufacturing, operations management, but also SCM. With the changing scope of retailing, global retailers have showed great interest on SCM, which, according to Sparks (1998) it has changed during the last decades. New concepts such as Quick Response (QR), Efficient Consumer Response (ECR) and Collaborative Planning Forecasting and Replenishment (CPFR) have been introduced in retail industry to enhance and highlight the importance of supply chain performance (Sparks and Wagner, 2003).

After providing statistics on the global retail industry, it will be useful to discuss and evaluate retailing industry in Turkey to compare and assess its position and structure. In relation to this, Table 7 displays the comparison of retail industry based on expenses classification in selected European countries, showing that Turkey has the 7th rank, which has higher retail expenses than the Netherlands, Poland, Belgium, Greece, Sweeden, Ireland, Portugal and Czech Republic.

Table 7 Comparison of Retail Industry Based on Expenses Classification in Selected European Countries (2007- $ billion)

Country	**Population (million)**	**Consumption Expenses**	**Retail Expenses**	**Share of food expenses (%)**	**Food Expenses**	**Retail Expenses Excluding Food Expenses**
Germany	82.2	1,780.2	678.3	26.0	176.5	501.8
UK	61.2	1,673.3	644.6	19.2	123.5	521.1
France	61.9	1.435,4	567.0	31.8	180.3	386.7
Italy	59.0	1,264.4	395.8	42.7	169.1	226.7
Spain	45.3	850.0	360.4	29.7	106.9	253.5
Russia	141.1	684.2	322.3	55.4	178.4	143.9
Turkey	**71.5**	**484.4**	**232.5**	**56.0**	**130.2**	**102.3**
The Netherlands	16.4	357.9	148.9	22.6	33.6	115.3
Poland	38.0	259.7	129.6	37.4	48.5	81.1
Belgium	10.6	229.2	94.4	28.8	27.2	67.2
Greece	11.2	238.8	79.5	40.5	32.2	47.3
Sweeden	9.2	207.3	77.1	28.1	21.7	55.4
Ireland	4.4	113.3	60.9	13.6	8.3	52.6
Portugal	10.7	150.7	49.7	49.3	24.5	25.2
Czech Republic	10.3	86.1	48.1	25.6	12.3	35.8

Source: AMPD

When the retail sales growth of Turkey is examined between 2006 – 2011, the impact of global financial crisis can be observed. However, Turkey's retail sales growth is estimated to increase in 2011.

Table 8 Retail Sales Growth (%)

Country	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***
Bulgaria	6.1	2.8	0.1	-7.3	-0.5	2.4
Czech Republic	3.8	5.4	1.5	-7.7	1.1	3.6
Hungary	2.5	-4.3	-4.6	-6.1	-1.3	2.9
Poland	7.2	8.0	10.3	-2.9	1.5	4.3
Romania	24.0	17.8	14.2	3.0	4.3	6.9
Russia	14.1	16.1	13.5	-3.0	2.5	4.3
Slovakia	5.9	4.7	20.7	-3.8	1.6	4.7
Turkey	**3.0**	**3.4**	**-1.2**	**-5.0**	**-0.2**	**2.4**
Ukraine	10.0	15.3	2.0	-12.1	-2.3	2.3

Source: PWC (2010) report cited in Glimmers amid the gloom

The next part provides comprehensive insight and recent statistics relating to Turkish retailing industry, to give a detailed view of the current situation.

2.3. Retailing Industry in Turkey

This part will provide wider outlook of the retailing industry in Turkey. First of all, the evolution of retailing industry in Turkey needs to be considered. In modern Turkey, passages and bonchmarches opened in Beyoglu can be given as the first explains retail store (Cengiz and Ozden, 2003).

Sümerbank, the first chain store was opened by the state in 1954. Later, Migros was founded as a joint venture of Switzerland, Istanbul Municipality, Agricultural Products Bureau and State Corporation for the production and distribution of meat and fish products. Following this investment, Gima was founded in 1956. In 1975, Switzerland sold all its shares to Koc Holding.

As in other industries, food retailing in Turkey was mainly under control of central and municipal governments, ensuring merchandise quality, prices, and/or margins (Kumcu and Kumcu, 1987). Apart from this, government has also been directly involved in establishing and running supermarkets since the early 1950s (Tek,1986). At that time period, many stores that had self-service area of 150-200 m^2 called themselves "supermarkets" (Tek, 1986).

Today, the retailing industry in Turkey is very different. In order to provide more insight, recent statistics will be used which are key macroeconomic data, rank of global retail opportunities, retail revenues of Turkey, market share of different retail types, geographical dispersion of retail stores, retail sales according to retail formats and market share of food retailers are presented.

The key macroeconomic data is essential to highlight the importance of population and consumer spending on retail sales. Table 9 presents key macroeconomic data of Turkey between 2006-2010.

Table 9 Key Macroeconomic Data of Turkey (2006-2010)

	2006	***2007***	***2008***	***2009***	***2010***
Inhabitants(mn)	68,133	68,894	69,659	70,431	71,213
GDP (USD mn)	525,322	642,921	727,392	604,908	680,438
GDP/capita (USD)	7,710	9,332	10,442	8,589	9,555
GDP (% real growth)	6,9	4,7	0,9	-6,5	3,7
Consumer price inflation (%)	9,6	8,8	10,4	6,2	6,8
Consumer spending (USD mn)	370,479	455,761	506,944	425,312	483,433
Consumer spending/capita (USD)	5,438	6,615	7,278	6,039	6,789
Retail sales, net (USD mn)	184,830	224,985	247,816	207,914	234,111
Retail sales, net/capita (USD)	2,713	3,266	3,558	2,952	3,287

Source: Planet Retail, GDP and other data presented in annual average exchange rates

As it can be observed from the above displayed table, regarding the increase in GDP, consumer spending and retail sales have increased dramatically. Recent past faced an increasing growing tendency in terms of retail sales. Conversely, Turkey's ranking in global opportunies list has declined, as shown in Table 10.

Table 10 Rank of Global Retail Opportunities

2008	**2007**	**Country**	**Region**		**2008**	**2007**	**Country**	**Region**
1	1	China	Asia-Pacific		16	10	Japan	Asia-Pacific
2	2	Russia	Eastern Europe		17	14	Spain	Western Europe
3	3	U.S.A	North America		18	11	Nigeria	Africa
4	6	India	Asia-Pacific		**19**	**12**	**TURKEY**	**Eastern Europe**
5	5	Malaysia	Asia-Pacifc		20	19	Tailand	Asia-Pacific
6	7	South Africa	Africa		21	24	Belgium	Western Europe
7	4	UK	Western Europe		22	22	South Korea	Asia-Pacific
8	8	Australia	Asia-Pacific		23	29	The Netherlands	Western Europe
9	9	Canada	North America		24	26	Indonesia	Asia-Pacific
10	21	Brazil	South America		25	25	Mexico	North America
11	15	France	Western Europe		26	27	Switzerland	Western Europe
12	16	Vietna0m	Asia-Pacific		27	18	Germany	Western Europe
13	13	The Philippnes	Asia-Pacific		28	28	Taiwan	Asia-Pacific
14	17	Sweeden	Western Europe		29	23	Poland	Eastern Europe
15	20	Argentina	South America		30	30	Italy	Western Europe

Source: Deloitte (2010)

As discussed previously, global retail opportunities exist in the regions of Asia Pacifica, North America, Western and Eastern Europe. This means that in these regions, there are market expansion opportunities for global retailers.

The dramatic decrease of Turkey's rank in 2008 can be explained by the serious impact of global financial crisis. Although the retail industry in Turkey is considered to provide global opportunities, it is also essential to examine how revenues are generated. Table 11 displays retail revenues of Turkey.

Table 11 Retail Revenues of Turkey (in dollars)

	TÜİK Trade Revenue Data (2008)			**TÜİK Trade Revenue Data + Unregistered Trade (2008)**		
	Billion $			Billion $		
Total Revenue	161			190		
Conventional Retailing	94	58%		123	65%	
Organized Retailing	67	42%		67	35%	
Food Retailing	90	56%	100%	106	56%	100%
Conventional Food	61	38%	68%	77	41%	73%
Organized Food	29	18%	32%	29	15%	27%
Retailing (Non-Food)	71	44%	100%	84	44%	100%
Conventional	33	20%	46%	46	24%	55%

Table 11 (Continuing)

(Non-Food Retailing)						
Organized (Non-Food Retailing)	38	24%	54%	38	20%	45%

Source: TÜİK Trade Revenue Index, AMPD Revenue Index, Ministry of Finance

In Turkey, the share of unregistered trade is still high. When the market value of black economy in retailing industry is taken into consideration, the revenue of Turkish retailing industry is $190 billion. Regarding to this calculation, the share of organized in entire retail industry, falls froms 42% to 35% (AMPD, 2010).

According to TUIK data, conventional retailing has a market share of 58%. Conversely, organized retailing's market share is 42%. Total revenue generated from retailing industry is comprised of food retailing (56%) and non-food retailing (44%). Both in food or in non-food retailing, the share of organized retailers is relatively low compared to conventional retailing sector.

Market share of different retail types is comprised of grocery shops, markets open bazaars, individual markets, local chains and organized retailers. Table 12 presents the market share of different retail types in 2008 and 2009.

Table 12 Market Share of Different Retail Types in 2008 and 2009

Sales Channels	***Market Share (2008)***	***Market Share (2009)***	***Increase in Market Share (annual)***
Groceries, markets and open bazaars	40.2%	35.9%	-10.7%
Individual markets	15.33%	15.3%	-0.2%
Local chains	8.17%	9.6%	17.5%
Total conventional	57.0%	52.7%	-7.5%
Organized retailing	41.6%	41.7%	0.2%

Source: AMPD (2010)

The market share of groceries, markets and open bazaars increased approximately 10% in 2009. On the other hand, there has been dramatic increase in the market share of local chains. In the last decades, share of conventional retailing has decreased, while the share of organized retailing is increasing. It is estimated that organized retailing will continue to grow in the coming years as well.

Market share of food retailing is slightly higher than non-food retailing. Although the dominance in revenue generation belongs to food retailing, providing statistics on retail sales according to food and non-food retail types enables greater insight into the market share of different retail formats.

Table 13 Retail Sales according to Retail Formats (2003-2008)

Million (TL)	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***
Store Based	132,673.2	139.182,1	144,183,3	155,766.6	173,079,1	189,812.6
Food	70,145.0	72,097.6	73,669.5	78,226.2	86,173.7	91,504.3
Hypermarkets	2,022.8	2,180.8	2,322.0	3,042.6	4,343.0	5,298.5
Supermarkets	15,163.2	16,101.5	16,861.9	19,020.2	22,824.2	25,061.0
Discount Stores	3,069.4	3,492.6	3,927.5	4,870.0	7,207.7	8,879.8
Small scale food retailers	32,242.0	32,527.8	32,850.2	33,247.3	33,626.4	33,929.0
Food/beverage/ cigarette	17,647.5	17,795.0	17,908.0	18,046.0	18,172.3	18,335.9
Other food retailers	-	-	-	-	-	-
Non-Food	62,528.2	67,084.5	70,313.8	77,540.5	86,905.4	98,308.3
General Retailers	949.7	1,041.8	1,172.3	1,373.3	1,789.1	2,059.5
Health & Beauty	8,878.8	8,954.6	9,090.8	9,292.6	9,499.6	9,861.9
Clothes & Shoes	15,234.0	15,511.0	16,162.5	17,552.5	19,307.7	21,624.6
Home and Garden	13,295.2	13,989.2	14,650.8	15,965.3	17,469.8	19,106.2
Electronics & Equipments	13,558.7	15,586.1	15,714.9	16,659.4	17,764.6	19,949.7
Free time and personal care retailers	10,611.8	12,001.8	13,522.6	16,697.5	21,074.5	25,706.4

Source: AMPD (2010)

Food retailers have higher sales revenue compared to non-food retailers. The role of organized food retailers is significant to lead the increase in organized retailing, which is displayed in Table 14.

Table 14 Market Share of Organized Food Retailers (%)-(2004-2008)

	2004	**2005**	**2006**	**2007**	**2008**
Migros Ticaret A.Ş.	2.6	3.1	4.8	5.1	5.5
BİM Birleşik Mağazacılık A.Ş.	1.9	2.3	2.8	3.5	4.3
Carrefour SA Carrefour Sabancı Ticaret Merkezi A.Ş.	1.7	2.1	2.4	2.4	2.5
Tesco Kipa Kitle Pazarlama Ticaret ve Gıda Sanayi A.Ş.	0.5	0.6	0.8	1.1	1.4
Kiler Alışveriş Hizmetleri A.Ş.	0.3	0.4	0.7	0.7	0.8
Petrol Ofisi A.Ş.	1.2	0.8	0.8	0.7	0.7
Metro Group	0.5	0.5	0.5	0.5	0.5
Şeref Makromarket A.Ş.	0.1	0.1	0.2	0.4	0.4

Source: PWC (2010)

Turkish retailing industry is still dominated by more than half a million small, independent shops located throughout the country (Deloitte, 2011-Emerging Markets Report). In the food (hypermarket) category, foreign players such as Metro, Tesco and Carrefour dominate the market. Due to this dominance in the home market some Turkish retailers have started to invest outside of Turkey.

In this sense, it is useful to paraphrase the evaluation of Turkish retailing scene from Deloitte's report (2010, p.34). According to the report, Turkish retail scene can be illustrated with the following insights: "*The big trend in Turkish retailing over the past decade has been the rise of the discount store channel. Discounters were the*

main beneficiaries of the economic instability in the early 2000s and have seen uninterrupted growth since, with store numbers exploding across the country. BIM, for example , now has over 2,600 outlets, compared to just 21 at the end of 1995. Other significant players include Şok (Migros Ticaret) and Dia (Carrefour), while A 101 only opened its first store in April 2008 and ended its first month with 121 outlets up and running. In fact, the downturn in consumer confidence from 2008, combined with accelerating food prices, means that discount stores are well positioned for further growth in the coming years. The growing popularity of the discount channel means that BIM is set to overtake long-standing market leader Migros Ticaret (formerly Migros Türk) in 2011 to become Turkey's largest grocery retailer. Migros Ticaret's acquisition by private equity in 2008 could open the possibility of its future sale to a rival in the market – or possibly Walmart.

Turkey has emerged as an important market for major foreign grocers, with Metro Group, Carrefour and Tesco all present. Also the entry of DSGi, Kesa and, most recently, Best Buy illustrates that the market has become a priority for non-food retailers as well. However, local players continue to hold their own and in many cases are continuing to grow strongly, thanks to continued consolidation and also the popularity of the discount channel (which tends to be dominated by local firms). Local supermarket player Kiler is one worth watching, thanks to its strategy of acquiring smaller local firms and its ambition to grow to become one of the top three retailers in Turkey. In terms of the electronics sector, Teknosa is also performing well against its foreign rivals, developing new formats, such as the Exxtra superstore concept. The company reported that even though the electrical market in Turkey contracted by 13 percent in 2009, Teknosa was still able to grow its sales by 15 percent."

These quotations show that the increasing role of discount stores and non-food retailing should be examined. It can be observed from the Table 15 as the share of global retailers is high in organized food retailing.

On the other hand, it is necessary to mention about the newly opened stores and increasing number of shopping malls in Turkey. In 2009, 13 stores were opened daily. This is an expected result due to the dynamism of the industry, representing an investment of $ 100-120 million monthly by the organized retailers (AMPD Retail Index-Nielsen, 2009). Also in the same year, 26 shopping malls were opened. As a result of these new openings, the number of shopping malls in Turkey increased to 210. Among 210 shopping malls, 71 of them are located in Istanbul. Total rent area for retailing increased to 5.696.000 m^2 by the end of 2009 (AMPD, PWC Report 2010).

Apart from using statistics to explain the structure of retailing industry, the performance of retailers plays key role in enhancing their sales and market share. However, literature on retail store performance measurement in Turkey is limited. Existing studies take consumer preferences and perception into consideration to measure and assess performance (e.g. Gunay, 2009). The performance assessment of final chain member (retail store) is important for providing a holistic view. However, in Turkey it is very problematic to get access to real company data for analysis. Therefore, retail store performance measurement with real company data will provide deeper understanding of the performance of the retailer, based on selected inputs and outputs.

In brief, regardless of the retail type, the main role of retailers is to deliver right products at the right time and place with the desired value and price. However, to fulfill these aims, the retailers should deal with many issues simultaneously. Hence, interdisciplinary approach in retailing is needed.

2.4. Interdisciplinary Approach in Retailing Research

Through research, each discipline tries to help academicians and practitioners by providing theoretical and managerial implications. These implications aim to direct researchers to research areas, providing theoretical and practical information to improve any situation. From retailing research point of view, enhancing retail performance is a key to succeed in retailing industry. According to Mattila et al. (2002), retail success can be defined as achieving high gross margins and customer service levels (i.e. being in-stock) with as little inventory as possible.

It is evident that to succeed in retailing, an interdisciplinary approach is needed. For instance, retailing has interfaces with marketing in terms of trade promotions, consumer promotions and store brands (Ailawadi, 2001).

Retailing research has been considered as marketing research within the retailing context (Cox and Brittain, 2004). However, in order to succed in the retailing industry, the role of effective and efficient logistics, marketing and SCM are vital. For instance, speed of supply chain is a key driver to achieve the “holy grail of retailing”. Research by Lynch and Whicker (2007) revealed that interface areas between logistics and marketing are product, packaging, promotion, distribution, pricing,

inventory and forecasting. It is also emphasized in the statement "offering the right product in the right place at the right time for the right price." (Cachon and Fisher, 2000). Cronin (1985) states that marketing strategies are applied in retailing industry to enhance growth in sales volume and to increase market share. Moreover, marketing strategies serve decisions on market segmentation, targeting and positioning that are centric on product, price, distribution and promotion (Jüttner et al., 2010; Kotler and Armstrong, 2007).

There are numerous studies that examine the interfaces and intersection of activities in marketing and supply chain management. However, it is beneficial to note that logistics and marketing functions have strong interaction as well. Gimenez and Ventura (2005) argue that customer service, packaging, distribution channels and information flow are intersection of activities in logistics and marketing. The interface between marketing and logistics is vital for providing customer service and the accomplishment of customer satisfaction (Lynch and Whicker, 2007). Enhancing customer service in supply chain is possible through better understanding of the requirement between cross-functional silos (Ellinger, 2000). Additionally, effective SCM necessitates coordination between marketing and logistics functions (Murphy and Poist, 1996).

Although the content of marketing and SCM seems clearly defined, the literature on this topic still has contradictory issues. According to a recent study by Jüttner et al. (2010), based on the existing literature on marketing and SCM integration, three perspectives can be classified: the interfunctional perspective, the process perspective and the perspective of integrated business concepts. The specific focus topics are:

interfunctional integration; marketing and logistics, marketing and manufacturing, process integration; integration of the key marketing and SCM processes, business concept; quick response, agile SCM and demand chain management (Jüttne et al., 2010).

Additionally, supply chain strategies involve a focal firm's orientation across chain members, and comprise process designs for the key supply chain business processes (Tokman et al.,2007). It is essential to note that integrating marketing and supply chain strategies is not an easy task. It requires integration at four levels, corporate integration, strategic customer integration, strategic supplier integration and supply pipeline strategy integration (Jüttner et al., 2010).

On the other hand, SCM can influence marketing strategies (Martin and Grbac, 2003). As stated before, Mattila et al. (2002) defined retail success as achieving high gross margins and customer service levels (i.e. being in-stock) with as little inventory as possible. Regarding this definition, retail success has two main factors, which are maximizing customer service and minimizing lost sales (Mattila et al., 2002).

In this sense, service level of a retailer is vital for providing retail success. Service level of retailer is assessed through measuring product availability (Harland et al., 2003). Therefore, performance of the retail stores is one of the key determinants for providing retail success, also acting as the last unit in the chain for providing customers the desired service level.

In retailing, related literature to assess the performance of the retailer (through retail success) is mainly in retail store performance measurement (e.g. Keh and Chu, 2003; Barros and Alves, 2003; 2004). Through the above mentioned groundings, research that contains interdisciplinary approach may provide significant results and better serve the current needs of retailing research. Therefore in the next chapter, literature review on retail store performance measurement, theories that emphasize supply chain perspective will be discussed.

CHAPTER 3

LITERATURE REVIEW ON RETAIL STORE PERFORMANCE MEASUREMENT AND THEORETICAL FRAMEWORK FOR SUPPLY CHAIN PERSPECTIVE

In this chapter, results of content analysis based on retail store performance measurement is presented. Additionally, theories that emphasize supply chain perspective and supply chain perspective are examined.

3.1. Content Analysis on Retail Store Performance Measurement Literature

Content analysis categorizes textual material, condensing it to more relevant, manageable parts of data (Weber, 1990). Content analysis is defined as (Stone et al., 1966, p.5) "any research technique for making inferences by systematically and objectively identifying specified characteristics within text. On the other hand, Krippendorff (1980, p.21) defines the method as follows: "Content analysis is a research technique for making replicative and valid inferences from data to their context."

Content analysis has been used in retailing industry in many studies (e.g. Jun and Cai, 2001; Yang and Fang, 2004; Anderson et al., 2007). In this study, content analysis has been used to examine the literature on retail store performance measurement. Therefore, the main page in University Library on-line catalogue 360 search (ABI

Inform Global, Ebrary Academic Complete, EbscoHost, Emerald Management E-Journals, IEEE Xplore, Jstor, Justis Celex, Oxford Journals Online, Sage Journals, Science Direct, SpringerLink, Web of Science and Wiley Blackwell databases) was employed, using “Retailing and performance” as keywords, producing 111 results. Next, “data envelopment analysis in retailing” was entered as key words, giving 24 results. Thirdly, “retail”, “store” and “performance measurement” keywords were used and giving 321 results. Lastly, “retail store performance measurement” and “retail store performance” provided 21 pages of results, which were examined according to their relevance with the keywords. According to these, the related content analysis literature review is displayed in Table 15.

In retail store performance measurement literature, technique to measure performance and the inputs and outputs selected play a critical role. Hence, Table 15 is prepared in light of these two important points (analysis level, inputs and outputs).

Table 15 Content Analysis in Retail Store Performance Measurement Based on Analysis, Inputs and Outputs

Authors	***Analysis Level***	***Inputs***	***Outputs***
Athanasseopoulos (1995)	DEA 31 Restaurants of a chain	the bar area (ft^2); the number of covers, market size (potential customers); the number of restaurants in a 1 mile-radius; the number of restaurants in 3-mile radius	Ffod sales (in value), sales of beverages (in value)
Barros and Alves (2003)	DEA 47 retail outlets of one of the leading hypermarket and supermarket Portugal chains, 1999-2000	number of full time employees, number of part time employees, cost of labour, area of outlets, absenteeism, number of points of sale, age of the outlet, inventory, other costs	sales, operating results
Barros and Alves (2004)	DEA 47 retail outlets of one of the leading hypermarket and supermarket Portugal chains, 1999-2000	number of full time equivalent employees, cost of labour, number of cash-out points, stock, other costs	sales, operating results
Barros (2006)	DEA and Tobit Model 22 main supermarket and hypermarket in Portugal 1998 – 2003	number of laborers, value of assets, Tobit model variables: share, outlets, ownership, regulation, location	Sales, operational results, value added
Donthu and Yoo (1998)	DEA and regression models 24 outlets of a fast food restaurant chain	store size, manager tenure, store location (inside a shopping mall versus free-standing), promotion/give-away expenses	sales (value), customer satisfaction (a five point scale)
Keh and Chu (2003)	DEA 13 USA stores, 1988-1997	labor: floor staff; management wages and benefits for the number of hours worked, Capital: occupancy, utilities, maintenance and general expenditure for	distribution services: accessibility, assortment, assurance of product delivery, availability of

Table 15 (Continuing)

		the area of the stores	information, ambience
Barros and Perrigot (2008)	DEA and bootsrap Tobit model 11 French generalist retailers, 2000-2004	labor: the number of equivalent full time workers, capital: the value of assets of the firm and costs	turnover, profits
Ratchford (2003)	Cost efficiency, DEA USA 54 retail food stores, 1959-1995	capital (share of labor in total cost), labor, intermediate services, price of intermeadiate services	conventional physical output (quantity of goods sold at each retail store), breath of assortment (index of average items per store), index of different services (e.g. bakery)
Rubio-Sellers and Ruiz-Mas (2006)	DEA 100 supermarkets chains in Spain 1995-2001	number of employees, number of outlets, capital: sum of own funds (capital plus reserve), level of debt (short and long term debt)	sales, profit
Rubio-Sellers and Ruiz-Mas (2007)	DEA-Malmquist productivity indices 96 supermarkets chains in Spain, 1995 – 2003	number of employees, number of outlets, capital: sum of own funds (capital plus reserve), level of debt (short and long-term debt)	sales, operational results
Thomas et al. (1998)	DEA, MANOVA 552 outlets of a USA multi-store, multimarket retailer	average number of full time employees per square foot of selling space times 10,000, the ratio of the average number of full-to part time employees, the total annual salaries and wages divided by payroll hours, the average hourly employee tenure in years, the average length of store managers' tenure in years, the age of the	sales, profits

Table 15 (Continuing)

		store in years, the base rent plus other occupancy expenses, divided by the total square footage of the selling space, dollars of annual operating expenses, divided by the total square footage of the selling space, dollars of annual operating expenses per store, population per store in the market, the average annual household income in a 2-mile radius, the number of households in a 2-mile radius, the distance in miles to the nearest alternative store, the total average inventory at cost in dollars, the average dollar size of transactions, the percentage of annual turnover, the dollar shrinkage divided by inventory dollars	
Barros (2005)	Cost efficiency, Stochastic Frontier Analysis	Price of labour, price of capital, population density, selling area of competitors, index of per capita purchasing power, rate of temporary workers, self absenteeism	Sales, earnings
Yu and de Angelo (2001)	DEA 204 companies in retailing in Brazil 1994-1998	number of stores, number of check outs, number of employees	gross sales
Mishra (2009)	DEA 25 retail stores	value of stock, recurrent costs mainly in the form of wages, floor space	annual sales, customer satisfaction
Kamanli (2004)	DEA and Statistical Analysis 15 retail stores	operating days, store area, cost of rent, inventory value, number of employees	Number of customers, customer satisfaction index, profit

In the literature, DEA is reported to be appropriate for the assessment of the efficiency levels of the intra chain retail stores, where with DEA, integration of a variety of performance metrics and obtaining a structured methodology to appraise retail store performance are possible (Thomas et al.,1998). For instance, in the study of Keh and Chu (2003), the efficiency level of 13 grocery stores belonging to a particular chain in the USA is measured. Barros and Alves (2003) analyze the efficiency of 47 retail outlets belonging to a leading supermarket chain in Portugal. Rubio-Sellers and Ruiz-Mas (2006) measure the relative efficiency of 100 supermarket chains in Spain. In all these studies, significant results are obtained towards improving the overall performance of the retail chains. The results of these studies indicate that the sample companies in the studies could have achieved the same level of outputs with less input levels. Additionally, it is revealed that lack of productivity growth does not necessarily reflect managerial failures or poor results.

Since retail industry is labor-intensive, productivity and efficiency measurement becomes a challenging issue (Ratchford and Stoops, 1988). The ratio of outputs to inputs is the common method for measuring productivity where there exists no single definition and measurement methodology to examine retail productivity in particular (Donthu and Yoo, 1998). Players in retail industry are in fierce competition, thus the intra efficiency levels of the retail supply chains become even more significant. In this sense, relative efficiency is a new approach to retail productivity measurement, which takes one retail store into consideration relative to the best performers, rather than the average performers, as in other traditional measures (Rubio-Sellers and Ruiz-Mas, 2007).

Research on the measurement and evaluation of individual store productivity in a multi-store market chain (e.g. Kamakura et al, 1996) is an emerging issue, in which different approaches can be implemented. There are a limited number of studies in the literature examining retail efficiency using DEA (e.g. Donthu and Yoo, 1998; Thomas et al., 1998; Keh and Chu, 2003, Barros and Alves, 2003; Barros and Alves, 2004). Despite the common input and output measures pertaining to efficiency of supermarket retail chains, some studies cover usage of different inputs and outputs.

Anthanasseopoulos (1995) argues that market efficiency is a key performance measurement variable in retail organizations. However, measuring market efficiency of a retail store is possible using adjustable and uncontrollable inputs simultaenously. In the study, performance improvement decision aid system was illustrated by data from a restaurant chain in the UK. Barros (2006) analysed hypermarkets and supermarkets working in the Portuguese market, and it was found that larger retail groups were on average more efficient than the smaller retailers and that national retailers are on average more efficient than regional retailers. This is due to the fact that scale plays an important role in this market.

Perrigot and Barros (2008) analysed 11 French general retailers through DEA and Tobit model. The study was the first attempt to report the efficiency levels of French generalist retailers. The general conclusion regarding the study was French retailers operate at high efficiency scores. The purpose of the study by Ratchford (2003) was to reveal and discuss the antecedents of the decline in productivity levels of retail food stores, which was found to be due to the lack of measurement of services offered by

retail food stores. It was concluded that productivity would increase if these services are taken into consideration in productivity measurement.

Kamanli (2004) used DEA and statistical analysis to measure the performance of 15 retail stores based on a quarterly provided data. The main aim of the study was to observe the effect of customer satisfaction on performance evaluation. Additionally, statistical analysis is performed to predict the variance of the dependent variables by the determined independent variables. Barros (2005) analysed the technical efficiency of a Portuguese hypermarket retail chain to investigate the chain performance. A stochastic Cobb-Douglas cost frontier model was performed to obtain retail efficiency scores. Panel data was used for the years of 1999 and 2000 on 47 retail outlets of a chain (47 outlets x 2 years = 94 observations). The general conclusion was based that hypermarket management improved the efficiency score of retail outlets.

Mishra (2009) deals with study of benchmarking in retailing and makes an evaluation on the performance of some selected retail stores in India. The analysis revealed the fact that retail store performance cannot be increased simply by increasing the level of sales. Apart from sales, other increasing other outputs such as customer satisfaction is essential to enhance performance.

After discussing literature review on retail store performance measurement, what is understood from supply chain perspective will be examined in the next section.

3.2. Supply Chain Perspective

During the last decades, supply chain management has attracted great interest both from practitioners and academicians. Although numerous studies were held in this field, there is still confusion on terminology and meanings of supply chain management (Croom et al., 2000). In this sense, providing definitions of supply chain management will be useful to discuss the supply chain perspective regarding the scope of this study. Table 16 provides definitions for SCM.

Table 16 Definitions of Supply Chain Management

Authors	**Definition**
Jones and Riley (1985)	An integrative approach to dealing with the planning and control of the materials flow from suppliers to end users.
Ellram (1991)	A network of firms interacting to deliver product or service to the end customer, linking flows from raw material supply to final delivery.
Christopher (1992)	Network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer.
Berry et al. (1994)	Supply chain management aims at building trust, exchanging information on market needs, developing new products, and reducing the supplier base to a particular OEM (original equipment manufacturer) so as to release management resources for developing meaningful, long term relationship.
Saunders (1995)	External chain is the total chain of exchange from original source of raw

Table 16 (Continuing)

	material, through the various firms involved in extracting and processing raw materials, manufacturing, assembling, distributing and retailing to ultimate end customers.
Kopczak (1997)	The set of entities, including suppliers, logistics service providers, manufacturers, distributors and resellers through which materials, products and information flow.
Tan et al. (1998)	Supply chain management encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). Supply chain management focuses on how firms utilize their suppliers' processes, technology and capability to enhance competitive advantage. It is a amanagement philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimization and efficiency.

Regarding the definitions, the supply chain consists of more than one organization. Therefore, supply chain perspective involves the impact of supply chain members on producing the desired service or products for the end users. Hence, in a supply chain structure performance of each chain member plays vital role for the organizations' success that exist in supply chain structure.

From retail supply chain structure, retail store is the member of the retail supply chain. Similar to other supply chain types, there are multiple suppliers, manufacturers, distributors, wholesalers, warehouses (distribution centres), retailers and end users. As discussed before, the success of retailer has strong dependence to the performance of the retail store if the physical retail store is the main selling unit. Therefore,

performance of retail store is not only dependent to its employees, shelf capacity, check out points, product range, location, etc. but also to the performance of its suppliers, distributors or distribution centre. In Figure 2, a typical retail supply chain is presented.

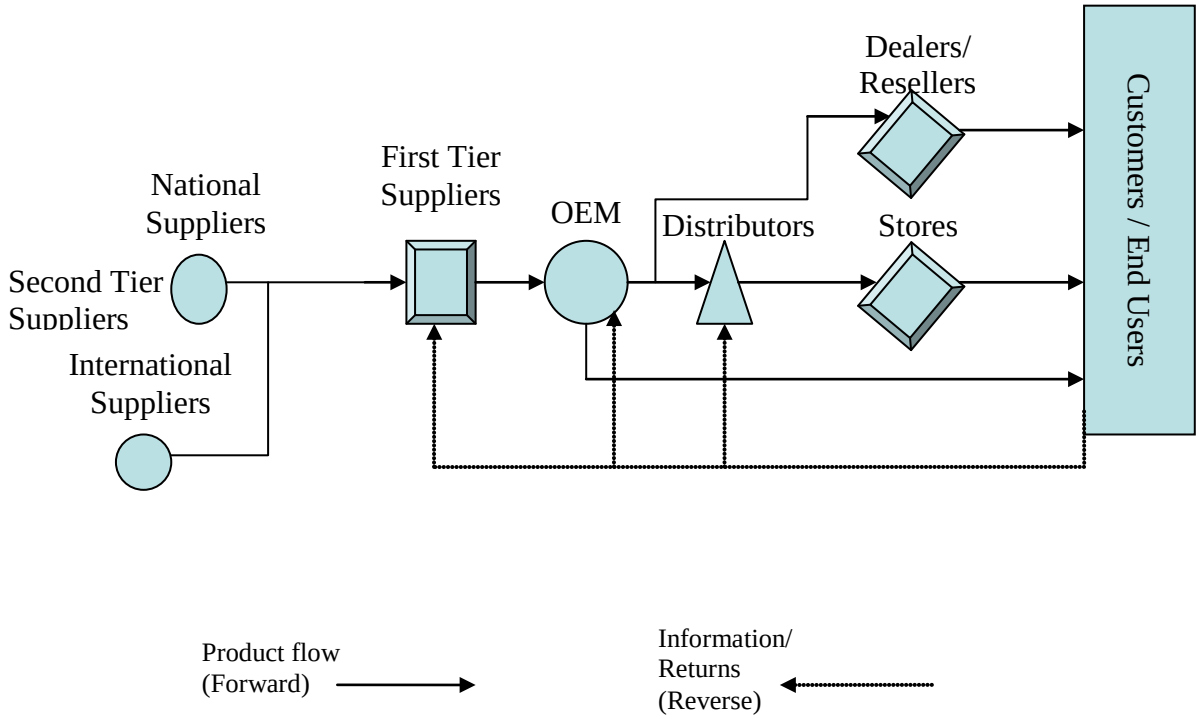

Figure 2 A Typical Retail Supply Chain
Source: (Ayers and Odegaard, 2007)

Although retail store performance measurement can solely be measured, assessment of the performance results should be done from a broader perspective. As stated in the previous paragraph, the success of the retail supply chain is dependent on the success of its members. Hence, in performance assessment supply chain perspective is essential for the retailers. It is useful to highlight that proper supply chain management is a tool to use supply chains as a strategic weapon (Ketchen et al., 2007). For instance, firms such as Wal-Mart, Toyota and Dell have used their supply chains to have competitive advantage over its competitors (Ketchen et al., 2007). According to Morash and Lynch (2002), supply chain capabilities and resources are

the main pillars to apply right supply chain strategy and a potential antecedent for competitive advantage. In this sense, supply chain perspective should be assessed through the capabilities and resources of supply chain members. While this study is held in retailing industry, main supply chain perspective that is considered here can be explained as follows: "*the role of retail supply chain members to provide the desired inputs in order to enhance the outputs which are necessitated by the retailer.*" This statement highlights the interaction of retail chain members to enhance performance. By its nature, interaction among chain members requires supply chain linkages to be managed. According to supply chain perspective, it is believed that supply chain linkages can provide better resource management to enhance outputs to the customers (Rungtusanatham et al., 2003). Supply chain perspective considers the role of chain members on the performance of the following members along the chain.

In this study, supply chain perspective has twofold: using variables that are influenced by supply chain management (values of the variables) and using theories that emphasize supply chain perspective to assess the performance of the retail stores.

Most of the variables used in this research reflect supply chain perspective. Among these, number of gaps, number of SKUs displayed, delivery frequency, sales and number of units sold clearly stand out.

For instance, number of gaps can be properly managed through effective coordination and integration with other chain members. According to a report by the Retailer A, number of gaps occur mostly as a result of supply problem. The number of gaps can be decreased with efficient and effective supply chain management, in this context the

role of supply chain members play vital role. The case for number of SKUs displayed is similar. A wide range of product categories enables consumer to find what they are looking for. Displaying numerous SKUs is possible through working with numerous suppliers and managing the supply chain accordingly. Another input which is delivery frequency is determined in light of the capabilities of other chain members such as distribution centre. Based on logistics and supply chain capability of the retailer, the retailer can make more frequent delivery than its competitors to its retail stores.

Among the four outputs used in analysis, two of them mainly reflect supply chain perspective which are sales and number of units sold. Sales is an important performance indicator and can be enhanced with successful supply chain members. Hence, sales of each retail store can be assessed if they can benefit from efficient and effective supply chain management performed by the retailer. Any failure in supply chain management is likely to impact sales level of the retail stores. Additionally, number of units sold is impacted by the other variables such as number of gaps, delivery frequency and sales. Therefore, the case of number of units sold is similar to sales.

Apart from these variables, the other variables used in this study have interaction with efficient and effective supply chain management. This study wants to reveal the supply chain perspective by using variables that are influenced with supply chain management. Additionally, the supply chain perspective is reflected by applying the theories that emphasize supply chain perspective. It is important to note that although supply chain perspective can easily be interpreted from managerial point of view, discussing theoretical support for supply chain perspective is essential. Hence, in the

following parts, related theories that emphasize supply chain perspective will be covered.

3.3. Related Theories that Emphasize Supply Chain Perspective

Before discussing the theories that emphasize supply chain perspective, it is important to understand that all disciplines have their own research traditions. The research traditions characteristically include a knowledge content (e.g., concepts and theories), proposed methodologies (i.e., research designs to create new knowledge content) and supported epistemologies (i.e., criteria for assessing knowledge claims) (Hunt and Davis, 2008). In this sense, supply chain discipline needs research based on creating specific knowledge on selected areas of focus.

Regarding this, retail store performance measurement via supply chain perspective is a new approach creating knowledge on the supply chain perspective in the assessment of retail store performance. The major function of research traditions is affording "grounding for" a specific research project to improve knowledge (Hunt and Davis, 2008). Therefore, this study aims to advance knowledge on retail store performance assessment through a supply chain perspective. Although supply chain management is now fully accepted as a newly emerged discipline, studies proposing theories, or referring to related theories remain in limited scope. Such studies are few in number (e.g. Ketchen et al., 2007; Simatupang et al., 2004; Grover and Malhotra, 2003; Giannakis and Croom, 2004). Hence, it is essential to examine the related theories that emphasize supply chain perspective. In regard to this approach, firstly there is a brief

discussion on the contexts in which theories of retail store performance assessment will be considered.

While supply chains differ according to their structures, it is essential to discuss the related theoretical perspectives to differentiate supply chain structures. Ketchen et al. (2007) enumarate the related theoretical perspectives for this differentation as follows: transaction cost economics, agency theory, resource dependence theory, institutional theory, game theory, network theory, social capital theory, strategic choice and resource-based view/knowledge base view.

Here, it is essential to mention briefly the content of these theories. In transaction cost economics, the main goal is to maximize profit by minimizing the internal transaction costs and between organizations (Ketchen et al., 2007). Additionally, agency theory focuses on situations in which the principal gives the right or initiative to act on its behalf, in this sense the agent acts on behalf of the principal (Eisenhardt, 1989).

Resource Dependence Model (theory) is interested in the dependence of firms to inputs (resources) to produce and survive in the market and how they manage their resources with relationship management (Pfeffer and Salancik, 1978). Another theory used to determine the supply chain structures is game theory, which is adopted from mathematics and presumed scenarios to draw conclusions about the probability of decisions and actions (Axelrod, 1984). Also, network theory is used to determine supply chain structure. This takes into consideration weak and strong ties and their interaction with each other, where strong ties enable greater reliability, enabling flexibility (Ketchen et al., 2007). Another theory that plays an important role

distinguishing supply chain structures is social capital theory. This theory considers employees as the main pillar in the identification of supply chain structure (Nahapiet and Ghoshal, 1998; Ketchen et al., 2007). Likewise, strategic choice theory focuses on managers' decisions as the main factor in the success or failure of firms (Child, 1972). The above mentioned theories allow supply chain perspective to be examined from different viewpoints.

Another interesting theory by its nature that emphasizes supply chain perspective is Theory of Constraints (TOC). The theory of constraints has been explained by Goldratt (1990) as a management philosophy which focuses on a constraint that inhibit the system from operating at a higher level of performance. In its content, TOC considers that every firm has at least one constraint, while it distinguishes the role of identifying the constraint(s) that inhibit the chain members from obtaining overall profitability (Simatupang et al.,2004). According to (Simatupang et al., 2004), the constraint can be anything that hinders the chain members from generating more profits. In the light of this study, a constraint can either be physical or non-physical and its location can be either internal or external. Examples of physical constraints are raw material shortages, limited capacity resources, limited distribution capacity and lack of customer demand, whereas non-physical constraints can be identified as outdated rules, procedures, measures, training, and operating policies that steer the way how decisions are made (Simatupang et al.,2004). On the other hand, the location of a constraint can be either internal or external. Raw material constraint, the capacity constraint and the distribution constraint are classified as internal location constraints, while market constraint is evaluated as external constraint (Simatupang et al.,2004). Some firms avoid applying TOC, feeling satisfied with regular procedures,

and often resist change (Goldratt,1990; Simatupang and Sridharan, 2002; Simatupang et al., 2004). In order to operate at desired service levels and increase profitability, all chain members should be aware of their constraints. Hence, attention should be given to the constraint(s) that impact the performance of the entire supply chain (Simatupang et al., 2004).

On the other hand, resource based view (theory) is also among theories that emphasize supply chain perspective. This is regarding the studies that are conducted on the premises of resource based theory as explained in the following paragraphs. The basic premise of resource based theory is discussed by Mahoney (1995, p.91) as follows: *"A firm should select the strategy that takes into account the relationship between its resources and environmental opportunities in the generation of rents (defined as "the return in excess of a resource owner's alternative use costs").* Apart from its basic premise, its assumptions should also be explained. Rents are obtained as a function of accumulating and utilizing heteregeneous resources in a superior manner than competitors, having scarce resource ownership and entrepreneurial insights in an uncertain environment (Mahoney, 1995). According to Penrose (1959) and Rumelt (1984) rent is determined as the way in which firms use its core competencies and resources, and also how they manage these. A core competence should make a significant contribution to the end product through perceived customer benefit while it should also be difficult for competitors to imitate (Prahalad and Hamel, 1990). Essentially, Resource-Based Theory uses the approach that sustainable competitive advantage is possible with valuable, costly-to- copy firm resources and capabilities (Hart, 1995).

In the context of this discussion of related theories that emphasize supply chain perspective, Resource-Based Theory needs more examination due to the fact that its content is more relevant to our research topic. Additionally, regarding research question 2, “Can resource based theory be used in assessing retail store performance measurement results?”, requires a broader perspective discussion of Resource-Based Theory, given in the next section.

3.3.1. Resource Based Theory (RBT)

Before discussing Resource-Based Theory, it is essential to note that in some studies is known as “resource based view” (e.g. Coff, 1999; Combs and Ketchen, 1999; Newbert, 2008). Therefore, in accordance with the studies, Resource-Based View and Resource-Based Theory are used interchangeably. Resource-Based Theory (RBT) evolved over the last decades. Numerous researchers have contributed to the development of RBT (e.g. Rumelt 1984; Aaker, 1989; Peteraf, 1993; Amit and Schoemaker, 1993; Wernerfelt, 1995).

The main premise of resource based view is based on the understanding that close competitors differ according to their resources and capabilities in important and durable ways thus, providing the background for competitive heterogeneity (Helfat and Peteraf, 2003). At this point it is essential to highlight the difference between resources and capabilities. Capabilities refer to skills that are dependent on human competencies, and resources refer to all the remaining assets (Markides and Williamson, 1996).

According to Combs and Ketchen (1999) the way firms manage resources impact their performance, and, differences in resources among firms can be a factor in explaining the differences in performance levels of firms while outputs are generated from resources. Hence, resources should have special attributes to enable firms operating at desired performance levels. Therefore, the resources must be valuable – providing that buyers are eager to pay for the resources' outputs at reasonable price, rare- the condition that buyers can not choose any other competitor, and finally, imperfectly imitable – supporting the view that competitors can not purchase the resources or use exactly the same resources (Barney, 1991; Peteraf, 1993; Combs and Ketchen, 1999). Additionally, Rungtusanatham et al. (2003) discuss that resources must be valuable to enhance efficiency and/or effectiveness, the resources must be rare such that regarding the control of the firm competitors can not use it, the resources must be imperfectly imitable and imperfectly mobile and they must not be substitutable such that competitors would not be able to identify the resources.

In the condition that resources and capabilities are easily accessible to each competitor in the same market, having the approriate resources and capabilities will be the main tools to operate in that market (Larsen, 1999). Larsen (1999) also states that the degree to which resources and capabilities are imitable is a key determinant for obtaining sustainable competitive advantage, so that if they are difficult to imitate, it is easier for the firms to have sustainable competitive advantage. When resources and capabilities are rare, challenging to imitate and valuable, they are either called strategic assets or core competencies (Prahalad and Gamel, 1990).

In order to highlight once more, a Resource-Based View takes into account the internal analysis by focusing on resources and capabilities together with the external analysis based on analyzing competitive environment (Collis and Montgomery, 1995). Resource-Based View examines competitive advantage through the assumptions that firms within an industry are likely to be heteregeneous regarding the strategic resources they control, and therefore the resources might not be perfectly mobile across firms (Barney, 1991). Resource-Based View also hypothesizes that the existence of resources and capabilities will enable the firm to improve its short-term and long-term performance (Barney, 1991; Barney, 1997). Figure 3 highlights the conceptual model that is developed by Barney (1991) displaying the interaction between resource attributes, competitive advantage and performance.

Figure 3 Barney's (1991) conceptual model cited in Newbert (2008)

Additionally, the major tenets of resource based view can be summarized as follows: "*each firm seeks for resources to compete, resources can either be tangible or intangible assets that are key inputs in the production and delivery of goods or services, capabilities are about organizational competencies to use the resources, competitive advantage can be provided by resources and capabilities which are rare, imperfectly mobile, not imitable by competitors and not substitutable."* (Rungtusanatham et al., 2003, p. 1089)

By its foundation, premises and assumptions, resource based theory (RBT) emphasizes the supply chain perspective for proper usage and evaluation. Larsen (1999) discusses the role of supply chain management in the light of RBT and indicates that RBT concentrates mainly on internal perspective in supply chain management. The main role of supply chain management is to provide strategic assets such efficiency in related supply chain activities and short order cycle time (Larsen, 1999).

On the other hand, Olavarrieata and Ellinger (1997) illustrate how RBT includes the theoretical support by highlighting the importance of logistics capability as the main source of sustainable competitive advantage and superior performance. While resources can vary according to their usage, it is essential to note that if resources enable the firm to operate at a lower cost structure, or to demand a price premium for the firms's products or services, it is very likely that the firm will have the opportunity for superior profits (Porter, 1980). Therefore, firms should be interested in obtaining the strategic resources to operate at desired performance levels. In this sense, Resource-Based View is directly linked to strategic resources and performance (Olavarrieta and Ellinger, 1997; Combs and Ketchen, 1999). Rumelt (1991) provided empirical evidence that strategic resources play vital role in predicting performance compared to market or industry characteristics. Scholars have used resource based view to explain the impact of resources and capabilities on performance (e.g. Brush and Chaganti, 1998; Morash and Lynch, 2002; Rungtusanatham et al., 2003; Newbert, 2008).

As discussed previously, while the supply chain is a network of organizations involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of goods and services for end-customers (Christopher, 1992), each supply chain member should use its resources in such a way as to be capable of contributing to sustainable competitive advantage.

In brief, Resource-Based View takes into consideration both internal and external analysis. From the external analysis point of view, the position of competitors plays a vital role. Although RBT can take a broader perspective, in the context of this study, it will be discussed solely from internal analysis point of view in the conclusion. This is due to available data regarding the retail stores of the retailer. If we had access to external environment data (e.g. retail store performance levels of competitors), we could discuss external analysis as well. RBT has found empirical evidence from few studies that covers supply chain perspective (e.g., Combs and Ketchen, 1999; Barratt and Oke, 2007). However, these studies are few in number.

According to Barney and Mackey (2005, p.5), *"the best resource based empirical work will involve collecting primary data from firms in a carefully drawn sample"*. In this sense, this study will discuss the usage of resource based theory on retail store performance results with collected primary data from a global retailer (in conclusion section regarding research question 2).

Before going further, it is important to note that based on literature review and discussing the theoretical background, this study will use four new variables that were not used before. These variables are number of units sold, delivery frequency,

number of gaps and number of SKUs sold. The explanation about the variables can be seen in the inputs and outputs selection section.

RBT uses the resources and capabilities as the main pillars to enhance competitive advantage. Apart from analysing the resources according to their attributes, it is also significant to analyse if the resources are efficiently used. Hence, measuring performance has important role to determine if resources are used efficiently. Regarding the scope of the study, resources are treated as inputs in Data Envelopment Analysis (which is the method used to measure the performance of retail stores). Therefore, the performance results of DEA enable the usage of RBT to assess the performance of retail stores. In this sense, this study is the first one to use RBT to provide insight for evaluating DEA results in retailing.

In the next chapter, methods to measure performance, main methodology which consists of Data Envelopment Analysis and statistical analysis (multiple regression and correlation), research design and inputs/outputs selection for analysis will be presented.

CHAPTER 4

METHODOLOGY

4.1. Methods to Measure Performance

Donthu and Yoo (1998) discuss that there is not a commonly accepted methodology of performance measurement in retailing. Hence, the proper methodology for performance measurement can be determined in light of the scope of the study. Among the performance measurement methods, Data Envelopment Analysis (DEA) measures the efficiency levels of units through the assumption that the units' operating function is represented by input-output models where input attributes are converted into goods or services (Anthanassopoulos and Ballantine, 1995). Apart from DEA, there exists other analysis such as Malmquist index (e.g. Hjalmarsson and Veiderpass, 1992). The Malmquist index is a bilateral index that can be used to compare the production technology of two economies and based on the concept of the production function. This is a function of maximum possible production, with respect to a set of inputs pertaining to capital and labor. Another method to measure performance is ratio analysis. It provides little insight in light of the effects of economies of scale, the benchmarking policies and the determination of overall performance measures of firms (Anthanassopoulos and Ballantine, 1995).

Another technique for assessing performance is Stochastic Cost Frontier Analysis (SCF). When SCF and DEA are compared; SCF models allow statistical influence, but have the disadvantage of being parametric and requiring strong assumptions. SCF

is a statistical technique that forms a stochastic error term and an inefficiency term by using the residuals from an estimated production or cost frontier. On the other hand, DEA does not require any statistical assumptions, has the advantage of being non-parametric and does not require any assumption about the production frontier (Jabocs, 2001).

As discussed in literature review section, the usage of DEA to assess the performance of retail stores is dominant. In light of literature review and deterministic structure of data (assessing past with actual data), DEA is chosen as the method to assess the performance of retail stores. In the next part, DEA is discussed.

4.2. Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) is based on Farrel's study (1957) to determine the performance of units. Charnes et al. (1978) first introduced the term DEA to describe a mathematical programming approach for the performance measurement of units. It is a programming technique derived from operational research, which calculates he scores stating efficiency by linear programming (Barros, 2006).

In DEA, the unit of assessment is called as Decision Making Unit (DMU). DEA has been widely used as an performance measurement tool in numerous fields. For instance, in the banking industry (e.g. Casu and Molyneux, 2003), in hospitals efficiency measurement (e.g. O'Neill, 1998), in measuring farm production efficiency (e.g. Krasachat, 2004), in insurance industry (e.g. Cummins and Rubio-Misas, 2006), in universities (e.g. Flegg et al., 2004), local government (e.g. Hughes and Edwards,

2000) and in retailing as discussed in Chapter 3. Donthu and Yoo (1998) discuss that there is no uniform, broadly accepted definition of efficiency measurement methodology for retailing.

DEA is a non-parametric model. The main difference between non-parametric and parametric models is that the parametric models require functional relationship between the inputs and outputs while in the non-parametric models no functional relationship is considered (Rubio-Sellers and Mas-Ruiz, 2007). It is important to note that neither technique is dominant to the other one (Gong and Sickles, 1992).

According to Charnes, et al. 1996 (p.8) DEA, - concentrates on individual observations in contrast to population averages, - produces a single aggregate measure for each Decision Making Unit (DMU) in terms of its utilization of input factors (independent variables) to produce desired outputs (dependent variables), - can at once utilize multiple outputs and inputs with each being stated in different units of measurement, - can adjust for exogenous variables, are value free and do not require specification or knowledge of a priori weights or prices for the inputs or outputs, - place no restriction on the functional form of the production relationship, - can accommodate judgment when desired, - produce specific estimates for desired changes in inputs and/or outputs for projecting DMUs below the efficient frontier onto the efficient frontier, - is Pareto optimal, - focuses on revealed best-practice frontiers rather than on central tendency properties of frontiers and satisfy strict equity criteria in the relative evaluation of each DMU. DEA is suitable to apply empirical approach because it directly determines which DMUs are maximizing efficiency (Charnes et al.,1996).

Although there is no restriction on number of variables to be used in DEA, Boussofiane et al. (1991) states that the number of DMUs to be analysed has to be at least twice more than the total number of inputs and outputs. Regarding the analysis in this thesis, it is obeyed to this rule. The number of DMUs is thirty three while the total number of inputs and outputs are ten. The other rule in DEA application is the assumption of homogeneity. Dyson et al. (2001) grounds the homogeneity rule in DEA as analyzing DMUs that uses the same kind inputs to generate the same kind of outputs. Regarding our research, we also obey the homogeneity rule by analyzing only the hypermarkets.

The mathematical illustration of a basic DEA model is presented below.

$$\text{Max } h_0(u,v) = \frac{\sum_r u_r y_{r0}}{\sum_i v_r x_{i0}}$$

subject to

$$\frac{\sum_r u_r y_{rj}}{\sum_i v_r x_{ij}} \leq 1 \quad \forall j = 1,...,n$$

$$u_r, v_i \geq 0 \quad \forall i, r. \qquad (1)$$

where:

y_{rj} - is the observed quantity of output r generated by unit j = 1,2, ……,n r= 1,2,..,n

x_{ij} – is the observed quantity of input i consumed by unit j = 1,2, …… ,n r= 1,2,..,n

u_r – is the weight computed given to output r by the interaction of all comparable DMUs

v_i – is the weight computed given to input i by the interaction of all comparable DMUs

Equation (1) displays a fractional model. In order to solve this equation linearly, it has to be converted to a linear programming model. Sherman and Ladino (1995) examine the capability of DEA as follows: a) DEA identifies the best practice DMU that uses the least resources to provide its products or services at or above the quality standard of other DMUs, b) compares the efficient and inefficient DMUs, c) determines the amount of excess resources used by each of the inefficient DMUs (reduction amount in input(s) to operate as an efficient DMU), d) determines the amount of excess capacity or ability to increase outputs for DMUs to be able to operate as an efficient unit, without the need to added resources (increase amount in output(s) to operate as an efficient unit).

The main procedures to apply DEA are to provide that the DMUs are in accordance with homogeneity rule, the DMUs are at least twice more than the total number of inputs and outputs and selection of inputs and outputs (Kazancoglu, 2008). In the evaluation of DEA results, the weights and value judgments play vital role. Regarding this, prior views on the value of individual inputs and outputs, relating the values of certain inputs and/or outputs, and incorporating prior views on efficient and inefficient DMUs are essential (Allen et el., 1997). All of the requirements are met. The related discussion to these requirements are explained in the regarding sections. While there are different models in DEA, model selection is necessary to apply DEA. Hence, in the following section, models in DEA are discussed.

4.2.1. Models in DEA

The main and most frequently models used in DEA are Charnes-Cooper-Rhodes (CCR-1978) and Banker, Charnes and Cooper (BCC-1984). The capabilities of CCR and BCC model can be written as follows (Charnes et al.,1996): the CCR model (1978) yields an objective evaluation of overall efficiency and determines the sources and estimates the amounts of inputs and outputs for inefficient DMUs, the BCC model (1984) determines inefficiencies by identifying variable returns to scale (VRS).

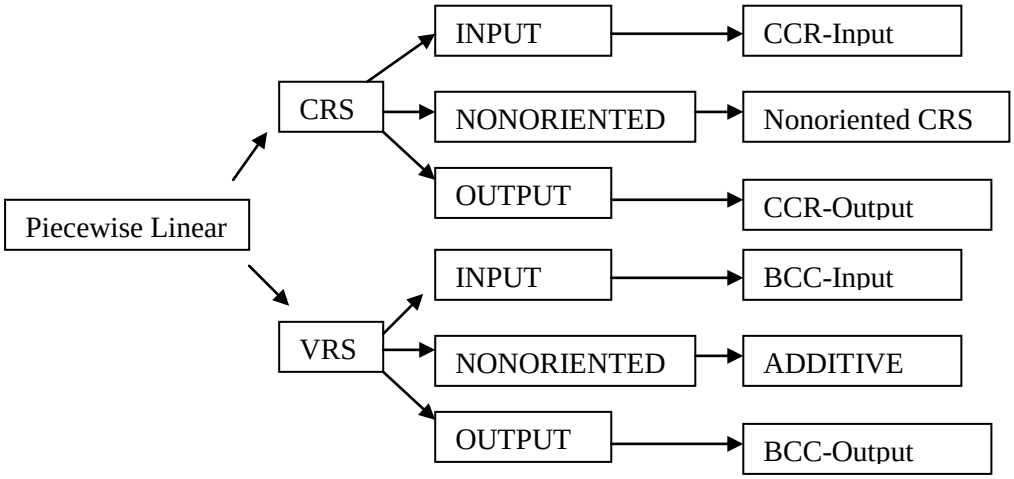

Figure 4 Classification by Returns to Scale and Orientation
Source: Charnes et al. (1996)

As can be observed from Figure 4, DEA models are divided into two main scale orientation which are CRS and VRS. Either CRS or VRS DEA models can be input, non oriented and output oriented. In the following parts, input oriented (CCR and BCC) and output oriented models (CCR and BCC) will be examined.

Input Oriented CCR Model

The model presented below is the form of input oriented CCR model that can be solved through linear programming. The mathematical formulation of the model is as follows (Charnes et al. 1996):

$$Q_k = \text{Max} \left(\sum_{r=1}^{p} U_r Y_{rk} \right)$$

subject to:

$$\sum_{i=1}^{m} v_i X_{ik} = 1$$

$$\sum_{r=1}^{p} u_r Y_{rj} - \sum_{i=1}^{m} v_i X_{ij} \leq 0 \qquad \text{j=1,…,n}$$

$$u_r \geq \varepsilon \qquad \text{r=1,...., p}$$
$$v_i \geq \varepsilon \qquad \text{i=1,…,m} \qquad (2)$$

here:

u_r : is the weight attached to output r to DMU k

v_i : is the weight attached to input i to DMU k

Y_{rk} :is the output r generated by DMU k

X_{ik}: is the consumed input i used by DMU k

Y_{rj}: r^{th} output for DMU j

X_{ij}: i^{th} input for DMU j

ε : a very small positive number

(DMU k is the DMU that is under consideration)

The decision on the efficiency level of the DMU is given according to relative efficiency value of DMU. If this value is 1, DMU is considered as efficient. If the value is less than 1 ($Q_{k)}$, then DMU_k is evaluated as inefficient. Reference sets are necessary for evaluating the necessary input and output levels for the DMUs that are inefficient. While forming reference sets is difficult in primal model, the dual model is necessary. In the following part, the dual model is presented (Input oriented CCR model)

Input Oriented CCR Model (Envelopment)

In CCR envelopment model, it is possible to examine which inputs and outputs can be decreased or increased. Additionally, in this model, it is easier to determine the reference sets. The mathematical formulation of the model is as follows (Charnes et al. 1996):

$$Q_k = \text{Min}\left(\alpha - \varepsilon \sum_{i=1}^{m} s_i^- - \varepsilon \sum_{r=1}^{p} s_r^+\right)$$

subject to:

$$\sum_{j=1}^{n} X_{ij}\lambda_j + s_i^- \alpha X_{ik} = 0 \qquad i=1,\ldots,m$$

$$\sum_{j=1}^{n} Y_{rj}\lambda_j - s_r^+ - Y_{rk} = 0 \qquad r=1,\ldots,p$$

$$\lambda_j \geq 0 \qquad j=1,\ldots,n$$

$$s_i^- \geq 0 \qquad i=1,\ldots,m$$

$$s_r^+ \geq 0 \qquad r=1,\ldots,p \qquad (3)$$

where:

α : coefficient stating the reducible amount of input(s) belonging to DMU k

Y_{rk} :the output r generated by DMU k

X_{ik}: the consumed input i used by DMU k

Y_{rj}: r^{th} output for DMU j

X_{ij}: i^{th} input for DMU j

λ_j: a scalar variable measuring the level of efficiency of DMU j

s^-: slack variable for input i belongs to DMU k

s^+: slack variable for output r belongs to DMU k

ε : a very small positive number

(DMU k is the DMU that is under consideration)

The decision on the efficiency level of the DMU is given according to relative efficiency value of DMU. If this value ($Q_{k)}$ is 1 (also α=1, s^- =0, s^+=0) than, DMU is considered as efficient. If the value is less than 1 (Q_k), then DMU_k is evaluated as inefficient. Also, when α coefficient is less than 1, the DMU is inefficient. The calculation of the hypothetical DMU which is formed by the DMUs that are in the reference sets of inefficient DMUs is as follows:

hDMU: denotes hypothetical decision making unit

$$X^{hDMU} = \sum_{j=1}^{n} X_{ij}\,\lambda_j$$

$$Y^{hDMU} = \sum_{j=1}^{n} Y_{rj}\lambda_j$$

In CCR envelopment (dual) model efficiency, the DMU is efficient if Q_k is equal to 1, and in the dual solution if α = 1 and all of the slack variables are equal to 0 (s^+ and s^-).

After examining input oriented CCR model, next part consists of output oriented CCR model.

Output Oriented CCR Model

The mathematical formulation of output oriented CCR model is presented as follows (Cooper et al.,2000):

$$Q_k = \text{Min}\left(\sum_{i=1}^{m} v_i X_{ik}\right)$$

$$subject\ to:$$

$$\sum_{r=1}^{p} U_r Y_{rj} - \sum_{i=1}^{m} v_i X_{ij} \leq 0 \qquad j=1,\ldots,n$$

$$\sum_{r=1}^{p} U_r Y_{rk} = 1$$

$$u_r \geq \varepsilon \qquad r=1,\ldots,p$$

$$v_i \geq \varepsilon \qquad i=1,\ldots,m \qquad (4)$$

u_r : the weight attached to output r to DMU k

v_i : the weight attached to input i to DMU k

Y_{rk}: the output r generated by DMU k

X_{ik}: the consumed input i used by DMU k

Y_{rj}: r^{th} output for DMU j

X_{ij}: i^{th} input for DMU j

ε: a very small positive number

(DMU k is the DMU that is under consideration)

In case of the Q_k value is equal to 1, then DMU under consideration is efficient. Q_k value of inefficient DMUs will be more than 1.

Output Oriented CCR Model (Envelopment)

The model presented below is the form of output oriented CCR model that can be solved through linear programming. Through this model, it is possible to find how much of the inputs and outputs can be decreased and increased that belong to inefficient DMUs. This is done to make a DMU efficient. The mathematical formulation of the model is as follows (Cooper et al., 2000):

$$Q_k = \text{Max}\left(\beta + \varepsilon \sum_{i=1}^{m} s_i^- + \varepsilon \sum_{r=1}^{p} s_r^+\right)$$

$$\sum_{j=1}^{n} X_{ij}\,\lambda_j + s_i^- - X_{ik} = 0 \qquad j=1,\ldots,m$$

$$\sum_{j=1}^{n} Y_{rj}\,\lambda_j - s_r^+ - \beta Y_{rk} = 0 \qquad r=1,\ldots,p$$

$$\lambda_j \geq 0 \qquad j=1,\ldots,n$$

$$s_i^- \geq 0 \qquad i=1,\ldots,m$$

$$s_r^+ \geq 0 \qquad r=1,\ldots,p \qquad (5)$$

where:

β: coefficient stating the increasable amount of output(s) belonging to DMU k

Y_{rk}: the output r generated by DMU k

X_{ik}: the consumed input i used by DMU k

Y_{rj}: r^{th} output for DMU j

X_{ij}: i^{th} input for DMU j

λ_j: a scalar variable measuring the level of efficiency of DMU j

s_i^-: slack variable for input i belongs to DMU k

s_r^+: slack variable for output r belongs to DMU k

ε : a very small positive number

(DMU k is the DMU that is under consideration)

In case of the Q_k value is equal to 1, then DMU under consideration is efficient. Q_k value of inefficient DMUs will be more than 1. Also β coefficient will be more than 1 if the DMU is inefficient. The calculation of the hypothetical DMU which is formed by the DMUs that are in the reference sets of inefficient DMUs is presented below. The calculation of the model will provide us how much inputs and outputs can be decreased or increased to operate as an efficient unit.

hDMU: denotes hypothetical decision making unit

$$X^{hDMU} = \sum_{j=1}^{n} X_{ij}\,\lambda_j$$

$$Y^{hDMU} = \sum_{j=1}^{n} Y_{rj}\lambda_j$$

or

$$X^{hDMU} = X^K - s_i^-$$
$$Y^{hDMU} = \beta Y^K + s_r^+$$

In CCR model, the DMU is efficient if Q_k is equal to 1, and in the dual solution if α = 1 and all of the slack variables are equal to 0 (s^+ and s^-). In the next part, input and output oriented BCC models will be examined.

Input Oriented BCC Model

Like in CCR model, in BCC model the optimal bundle of inputs are determined to enable DMU operate efficiently (Kazancoglu, 2008). The mathematical formulation of input oriented BCC model is provided below (Charnes et al.,1996):

$$Q_k = \max\left(\sum_{r=1}^{p} u_r Y_{rk} - \mu_0\right)$$

subject to:

$$\sum_{i=1}^{m} v_i X_{ik} = 1$$

$$\sum_{r=1}^{p} u_r Y_{rj} - \sum_{i=1}^{m} v_i X_{ij} - \mu_0 \leq 0 \qquad j=1,\ldots,n$$

$$u_r \geq \varepsilon \qquad r=1,\ldots,p$$

$$v_i \geq \varepsilon \qquad i=1,\ldots,m \qquad (6)$$

$$\mu_0: unconstrained$$

where:

u_r: the weight attached to output r to DMU k

v_i: the weight attached to input i to DMU k

Y_{rk}: the output r generated by DMU k

X_{ik}: the consumed input i used by DMU k

Y_{rj}: r^{th} output for DMU j

X_{ij}: i^{th} input for DMU j

ε : a very small positive number

μ_0: variable related to direction of returns to scale

The Q_k value is equal to 1 in efficient DMUs. For the inefficient DMUs, Q_k is less than 1. In the next part, BCC envelopment model is presented (input oriented).

Input Oriented BCC Model (Envelopment)

The duality of BCC model is mathematically expressed as follows (Charnes et al., 1996):

$$Q_k = \text{Min}\left(\alpha - \varepsilon \sum_{i=1}^{m} s_i^- - \varepsilon \sum_{r=1}^{p} s_r^+\right)$$

subject to :

$$\sum_{j=1}^{n} X_{ij}\lambda_j + s_i^- - \alpha X_{ik} = 0 \qquad i=1,\ldots,m$$

$$\sum_{j=1}^{n} Y_{rj}\lambda_j - s_r^+ - Y_{rk} = 0 \qquad r=1,\ldots,p$$

$$\sum_{j=1}^{n} \lambda_j = 1 \qquad r=1,\ldots,p$$

$$\lambda_j \geq 0 \qquad j=1,\ldots,n$$
$$s_i^- \geq 0 \qquad i=1,\ldots,m$$
$$s_r^+ \geq 0 \qquad r=1,\ldots,p \qquad (7)$$

where:

α: coefficient stating the reducable amount of input(s) belonging to DMU k

Y_{rk}: the output r generated by DMU k

X_{ik}: the consumed input i used by DMU k

Y_{rj}: r^{th} output for DMU j

X_{ij}: i^{th} input for DMU j

λ_j: a scalar variable measuring the level of efficiency of DMU j

s^-: slack variable for input i belongs to DMU k

s^+: slack variable for output r belongs to DMU k

ε : a very small positive number

(DMU k is the DMU that is under consideration)

If the DMU_k is efficient than Q_k is equal to 1. If the DMU is inefficient, the increasable output and reducible input can be calculated as follows:

hDMU: denotes hypothetical decision making unit

$$X^{hDMU} = aX^K - s_i^-$$
$$Y^{hDMU} = Y^K + s_r^+$$

In BCC model, the DMU is efficient if Q_k is equal to 1, and in the dual solution if α = 1 and all of the slack variables are equal to 0 (s^+ and s^-). In the next part, output oriented BCC model will be examined.

Output Oriented BCC Model

The aim of output oriented BCC model is similar to output oriented CCR model. The mathematical notation of output oriented BCC model is as follows (Cooper et al., 2000):

$$Q_k = \text{Min}\left(\sum_{i=1}^{m} v_i X_{ik} - \rho_0\right)$$

subject to :

$$\sum_{r=1}^{p} u_r Y_{rk} = 1$$

$$\sum_{r=1}^{p} u_r Y_{rj} - \sum_{i=1}^{m} v_i X_{ij} + \rho_0 \leq 0 \qquad j=1,\ldots,n$$

$$u_r \geq \epsilon \qquad r=1,\ldots,p$$
$$v_i \geq \varepsilon \qquad i=1,\ldots,m \qquad (8)$$

$$\rho_0 : unconstrained$$

where:

u_r: the weight attached to output r to DMU k

v_i: the weight attached to input i to DMU k

Y_{rk}: the output r generated by DMU k

X_{ik}: the consumed input i used by DMU k

Y_{rj}: r^{th} output for DMU j

X_{ij}: i^{th} input for DMU j

ε : a very small positive number

ρ_0: variable related to direction of returns to scale

In case of the Q_k value is equal to 1, then DMU under consideration is efficient. Q_k value of inefficient DMUs will be more than 1. In the next part, dual model of output oriented BCC (dual) is presented.

Output Oriented BCC Model (Envelopment)

$$Q_k = \max\left(\beta + \varepsilon \sum_{i=1}^{m} s_i^- + \varepsilon \sum_{r=1}^{p} s_r^+\right)$$

subject to:

$$\sum_{j=1}^{n} X_{ij}\,\lambda_j + s_i^- - X_{ik} = 0 \qquad i=1,\ldots,m$$

$$\sum_{j=1}^{n} Y_{rj}\lambda_j - s_r^+ - \beta Y_{rk} = 0 \qquad r=1,\ldots,p$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda_j \geq 0 \qquad j=1,\ldots,n$$

$$s_i^- \geq 0 \qquad i=1,\ldots,m$$

$$s_r^+ \geq 0 \qquad r=1,\ldots,p \qquad (9)$$

where:

β : coefficient stating the increasable amount of output(s) belonging to DMU k

Y_{rk}: the output r generated by DMU k

X_{ik}: the consumed input i used by DMU k

Y_{rj}: r^{th} output for DMU j

X_{ij}: i^{th} input for DMU j

λ_j: a scalar variable measuring the level of efficiency of DMU j

s^-: slack variable for input i belongs to DMU k

s^+: slack variable for output r belongs to DMU k

ε : a very small positive number

(DMU k is the DMU that is under consideration)

In case of the Q_k value is equal to 1, then DMU under consideration is efficient. Q_k value of inefficient DMUs will be more than 1. Also β coefficient will be more than 1 if the DMU is inefficient. The calculation of the hypothetical DMU which is formed by the DMUs that are in the reference sets of inefficient DMUs is presented below. The calculation of the model will provide us how much inputs and outputs can be decreased or increased to operate as an efficient unit.

hDMU: denotes hypothetical decision making unit

$$X^{hDMU} = \sum_{j=1}^{n} X_{ij}\,\lambda_j$$

$$Y^{hDMU} = \sum_{j=1}^{n} Y_{rj}\lambda_j$$

or

$$X^{hDMU} = X^K - s_i^-$$
$$Y^{hDMU} = \beta Y^K + s_r^+$$

Given the corresponding input-output information, DEA allocates weights for each DMU in order to maximize the efficiency score. Performing a linear optimization for each DMU, DEA finds the most efficient DMUs and creates a convex hull representing the efficient ones on the border.

4.2.2. DEA Model Selection for Analysis

In competitive markets, the DMUs are output oriented, while it is assumed that inputs are under the control of the DMU, which then aims to maximize its output(s), this is due to the fact that market demand and control are not possible for the DMU (Barros, 2006).

For retail industry, DEA provides several advantages including the simultaneous utilization of multiple input and outputs, accommodation of both controllable and uncontrollable factors, computation of a single index of productivity, developing a relative measure of performance for each retail store using best performers as the bases and no force on one functional form relating the inputs and outputs of all observations (Donthu and Yoo, 1998).

The DEA formulation necessitates a preference on orientation – minimization of inputs or maximization of outputs, a scale assumption- constant returns to scale (CRS) or variable returns to scale (VRS) (Charnes et al.,1996).

Input and output oriented models are likely to give different results in their variable returns to scale findings while the secured result may be based on the orientation used. Regarding the reasons discussed before and the industry characteristics, output oriented BCC model is chosen for analysis. In retailing, the VRS approach is preferred, while level of increase in input does not reflect as the same unit increase level in output level. Hence, in this thesis VRS model is used. The DEA model used for the analysis is adopted from Ozpeynirci and Koksalan's study (2007). The model

uses period index *t* to solve for the efficiencies of all DMU's simultaneously. It can be seen in the Appendix.

The variable returns to scale (VRS) model

The linear programming equivalent of VRS is stated below (Cook and Seiford, 2009):

$$e_o^* = \max \sum_r \mu_r y_{ro} - \mu_o$$

$$s.t. \sum_i v_i x_{io} = 1$$

$$\sum_r \mu_r y_{rj} - \mu_o - \sum_i v_i x_{ij} \leq 0, \qquad j = 1, \dots, n$$

$$\mu_r \geq \varepsilon, v_i \geq \varepsilon, \forall i, r, \ \mu_o unrestricted \tag{10}$$

The dual for which is given by

$$\min \theta_o - \varepsilon \left(\sum_i s_i^- + \sum_r s_r^+ \right)$$

$$s.t. \sum_j \lambda_j x_{ij} + s_i^- = \theta_o x_{io}, \qquad i = 1, \dots, m$$

$$\sum_j \lambda_j y_{ro} - s_r^+ = y_{ro}, \qquad r = 1, \dots, s$$

$$\sum_j \lambda_j = 1$$

$$\lambda_j, s_i^-, s_r^+ \geq 0 \ \forall i, r, j$$

$$\theta_o \ unrestricted \tag{11}$$

Variable returns to scale has additional constraint of $\sum_j \lambda j = 1$. This constraint enables model taking the variable returns to scale into consideration.

4.3. Statistical Analysis

In this thesis, statistical analysis is done to validate the findings and answer some of the research questions. In DEA model, 33 hypermarkets (DMUs) are analyzed. Regarding this, sample size for statistical analysis is 33. The sample size and population are the same, while for the time period that analysis data was collected, there were 33 hypermarkets open belonging to that global retailer. Statistical analyses is done with SPSS version 17.0.

Data used in SPSS analysis is obtained through taking the average value of each variable. For all input and output measures, the sum of weekly value for 52 weeks is taken and then divided by 52. This is done to use one data set for statistical analysis.

In previous DEA studies statistical analysis was used (e.g. Kamanli, 2004), such as descriptive statistics, correlation, cluster analysis and multiple regression analyses. In contrast, in this thesis, correlation and multiple regression are applied to reveal the relation between inputs and outputs, and to explain the variance in selected dependent variables with the determined independent variables. Other statistical analyses, such as cluster analysis, t-test, Analysis of Variance (ANOVA) and factor analysis are not applied because the sample size is not suitable for these analysis.

4.4. Research Design

Literature review on retail store performance measurement revealed the fact that number of check out points, shelf capacity, number of SKUs displayed, number of FTE, number of customers and sales were frequently used in data envelopment analysis studies while number of gaps, number of SKUs sold, number of units sold and delivery frequency were not used before. Additionally, most of the DEA studies were analysed with a single data set which consists of annual or montly data. This study displays the performance of retail stores from a weekly perspective. The phases of the research design are displayed in Figure 5 is done. Firstly, issues were identified in the first meeting held with executives in the retailer. Additionally, key performance indicators used in each department were discussed. The role of operations control and how operations are managed were explained comprehensively by the executives.

In phase 2, the researcher decided on the inputs and outputs that will be used in DEA. When deciding on the input and output measures, corporate strategy, corporate goals and managerial methods to measure efficiency were considered. Surprisingly, it was found that retailer A does not apply any holistic performance analysis on store base. Instead, they consider the predetermined key performance indicators for each department. For instance, supply chain department uses number of gaps, stock levels, waste levels, sales and forecast accuracy for each store. However, they do not apply a holistic performance measurement approach that uses multiple inputs and outputs simultaneously. Therefore, researcher designed holistic input and output measures in order to provide a supply chain perspective. The input and output measures were decided by considering the supply chain perspective and content analysis from the

literature. Afterwards, relevancy of these measures to all DMUs are discussed. While, the retailer A operates in two retail formats, express stores and hypermarkets, to provide relevancy and reflect supply chain analysis, hypermarkets are selected for the unit of analysis.

In Phase 3, a model is developed with the selected measures, and presented in part 1, under the title of a priori research model. After DEA model is constructed, related statistical analysis was conducted to be able to answer research questions. The interaction between input and output measures and prediction about number of SKUs sold and sales is measured through multiple regression analysis. Following the analysis, results obtained through DEA and statistical analysis were discussed with the executives. All of the results were found to be representative in terms of performance results and valid.

In Phase 4, managerial implications were discussed and the research model developed by the researcher was presented to management as the new model to measure holistic performance of the retail stores.

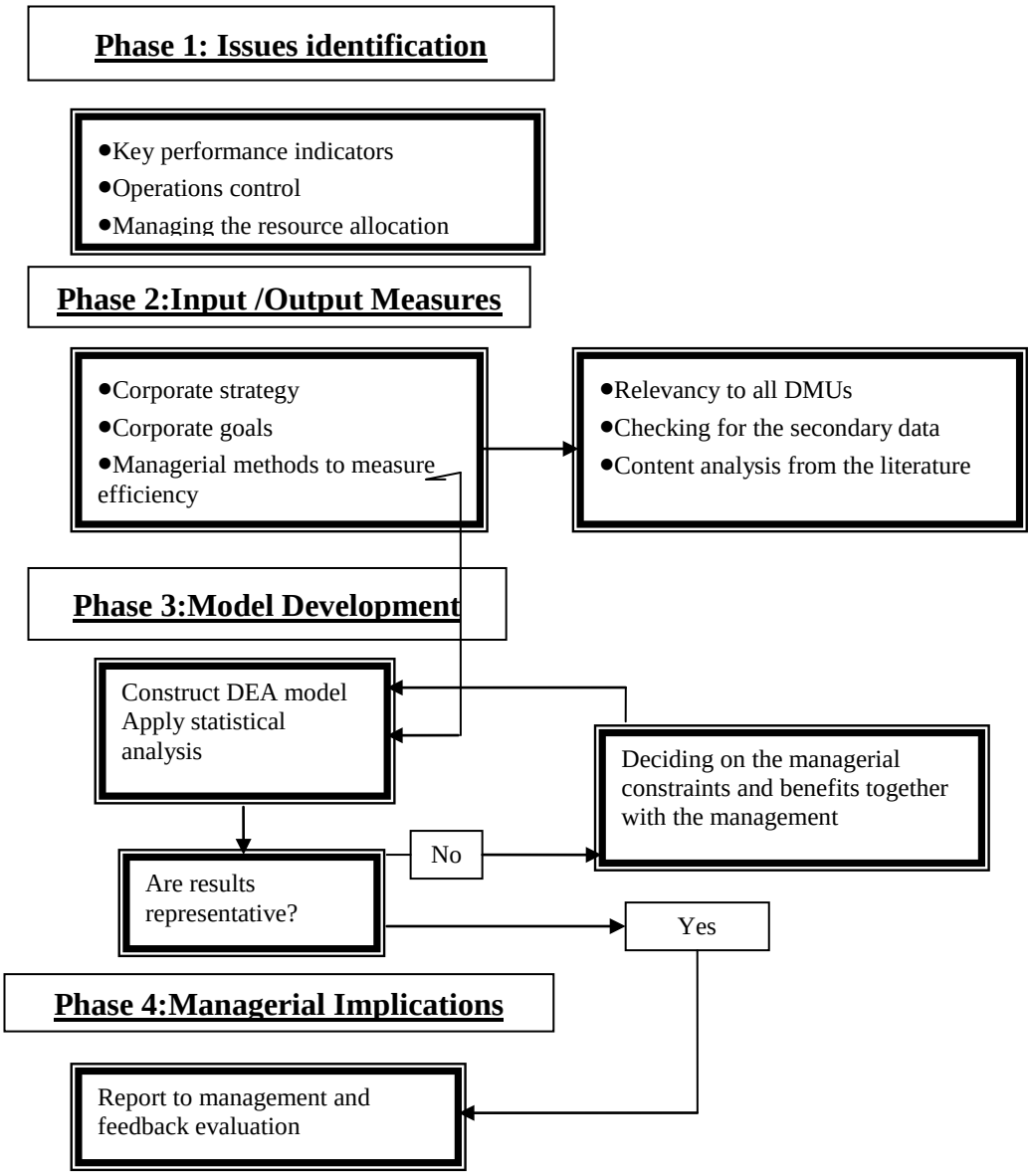

Figure 5 Main Phases of Research Implementation on the Industry Level
Source: Adopted from Thomas et al. (1998)

4.5. Inputs and Outputs Selection for Analysis

In the food category, there are four main global retail chains operating in Turkey. Analysis in this research is done with the data that is provided by a global retail chain that also operates in Turkish market as well as in other foreign markets. Due to confidentiality restrictions, the name of the retail supply chain will not be declared, but hereafter referred to as "Retailer A." The underlying reasons for chosing Retailer A is due to their openness to sharing data and belief in the importance of scientific work. The researcher tried to also contact to other retailers in the same category, however the attempts were not successful. We were fortunate to get this opportunity to conduct analysis with real company data.

An interview with the retail supply chain executives was held in July, 2009 to comprehend the current performance measurement system of the chain, and to check if there were other alternative inputs and outputs to be added or removed. The interview took approximately three hours, and after both parties were satisfied with the research topic, the necessary permissions from both parties were agreed. A confidentiality agreement has been signed between the retail supply chain and faculty members in November 2009. Regarding the terms of confidentiality agreement, the researcher can not publish any direct data belonging to retail supply chain. Therefore, analysis done in the research is displayed by taking into consideration this condition. The confidentiality agreement was signed by the retailer A and researcher covering the period between November 2009 – February 2011. The retailer provided the related data to the research for this time period.

Retailer A uses different performance approaches to different retail chain members. The interviews revealed the fact that separate performance indicators were used to assess the performance of different units. Moreover, there has been no store by store performance assessment. Although, some key indicators were taken into account when the performance of the stores were assessed, up to now, no weekly analysis has been applied.

Among the inputs and outputs used in the analysis, there exists new variables not previously employed in the literature. The researcher aimed to provide the importance of supply chain perspective with the chosen inputs and outputs. Among six inputs, number of SKUs displayed, delivery frequency and number of gaps are planned and eventuated regarding the capability and success of the retail chain members. Variety in number of SKUs is dependent to supply chain network structure of the retailer and is likely to be an important competitive advantage tool in the market. Delivery frequency which is selected as an input is impacted by the retail supply chain members such as supplier, manufacturer and distribution centre. It is determined regarding the supply chain structure of the firm. Additionally, number of gaps is related to on-shelf availability. Being on-shelf is possible through coordination between supply chain members and efficient supply chain management. On the other hand, all of the outputs reflect supply chain perspective while good supply chain management enables high output levels (e.g. sales, number of units sold, number of customers and number of SKUs sold). Achieving high output levels is also impacted by the efficient usage of inputs. This is why correlation analysis is conducted to reveal the interaction between inputs and outputs. Apart from this, while we have related

independent variables to predict number of SKUs sold and sales, multiple regression for number of SKUs sold and sales are conducted.

Additionally, a large scale data set is applied in the analysis, with a 52 week period. Research that contains DEA in retailing industry uses one data set (e.g. annual data). However, six inputs and four outputs are taken into consideration in this research. The entire list of the inputs and outputs is presented in Table X.

Apart from providing the performance of the hypermarkets, statistical analysis is applied with the aim of providing a wider range of theoretical and managerial implications.

The analysis done in this research analyses the hypermarkets. The analysis done in hypermarkets regarding the availability of data on selected variables (inputs and outputs). To overcome conflict on using the word hypermarkets and retail stores simultaneously in the analysis, thereafter the unit of analysis will be called retail store. The time period between March 2009 – March 2010 was chosen for two reasons. Firstly, research aimed to reveal the yearly performance of each retail store. Apart from this, some inputs and outputs chosen for analysis were not available for the other time periods. Although there were 41 Hypermarkets in that time period, only 33 retail stores were analyzed. The reason for this is based on the fact that some retail stores were established during this time period, and it was not possible to provide whole data set for these. Apart from this, it took a long time for the retailer to retrieve data for all 33 retail stores until November 2011. After the retailer provided the data set, processing data for the analysis took four months. In the following part,

comprehensive information and the data processing method will be explained in detail. Literature review on the inputs and outputs selected for the analysis was provided in the retail store performance measurement section, based on content analysis, and is not repeated here.

4.5.1. Inputs for Analysis

Inputs used in DEA and statistical analyses are number of SKUs displayed, number of check out points, number of FTE, shelf capacity, delivery frequency and number of gaps. In the following parts, these inputs will be explained briefly.

4.5.1.1. Input 1: Number of SKUs Displayed

This data is provided by supply chain department. The data was provided in weekly basis for all retail stores, revealing how many different stock keeping units are displayed for sale inside each retail store weekly. Number of SKUs displayed is an important indicator, because retailers compete through the different product categories and stock keeping units they display for sale. For consumers, finding the product they are looking for is a key determinant in store loyalty. Although this factor depends on-shelf availability, deciding on the number of SKUs that will be displayed is an important issue. The data given by the supply chain department is provided through the mechanism displayed in the following figure.

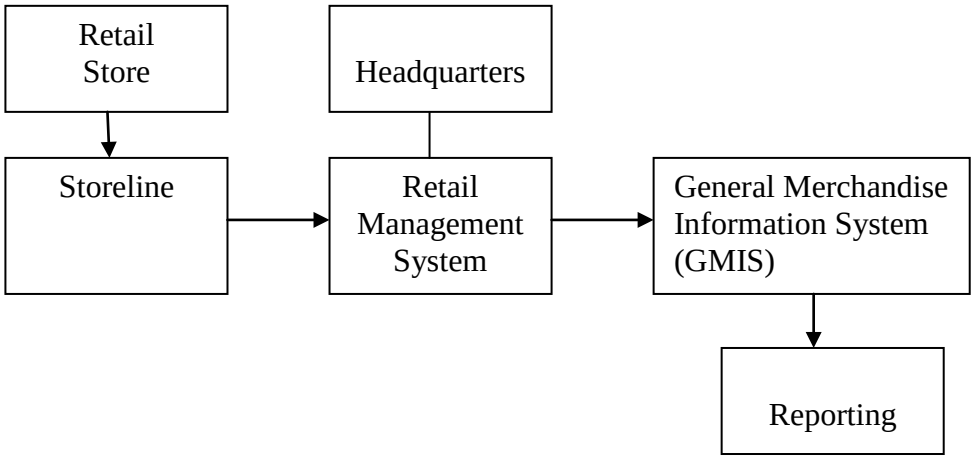

Figure 6 The Reporting System of Retailer A

Retail store transfers data to storeline systems through barcode and hand terminals, then the storeline transfers and loads data into the retail management system, which is directly connected to headquarters and continuously monitored. It transfers the related data to general merchandise information system. General merchandise information system (GMIS), which enables supply chain department to check and monitor each supply chain related activities. The supply chain department reports key performance indicators and plan their activities according to data provided by GMIS. It is important to note that that key performance indicators of supply chain department is the number of SKUs in stock and displayed, number of gaps, waste level (used as a key performance indicator since January 2011) and forecast accuracy level.

4.5.1.2. Input 2: Number of Check out Points

The store exit point is the check out counter. Data on the number of check out points is provided by the operation support department.

4.5.1.3. Input 3: Number of FTE

This data is provided by the operations support. It is provided weekly and store by store, covering all employees working in administrative and support activities. It is the number of full time equivalent employees. This number includes part time employees as well, however the total working hours of part-time employees is converted to number of full-time employees.

4.5.1.4. Input 4: Shelf Capacity

Shelf capacity data is provided by the supply chain department. It is calculated in Excel sheets by the sum of area of displayed SKUs. It is expressed in units, and displays the available area for selling the stock keeping units. It is provided on a store by store basis.

4.5.1.5. Input 5: Delivery Frequency

Delivery frequency data is also provided by the supply chain department. It is provided on a store by store basis. The data displays the weekly delivery frequency to each retail store. Supply chain department determines delivery frequency with distribution centre.

4.5.1.6. Input 6: Number of Gaps

It is not always possible for a retailer to provide all the displayed stock keeping units, so retailers measure this through onshelf availability data. In this sense, number of gaps displays that the retail store was out of stock in a variety of number of stock keeping units. Number of gaps data is calculated using Excel sheets. The related Excel sheets contained the order list information. In the order list, the SKUs that have "0" value mean out of stock, i.e. a gap. The researcher counted the all "0" values in the lists and calculated the weekly number of gaps in each retail store. The order lists are prepared by supply chain department, considering the data transferred to general merchandise information system from retail stores. It is essential to note that, data regarding number of gaps is calculated every day at 4:00 pm, by counting the shelves with hand terminals. The shelves are monitored twice a day, at 09:00 am and at 04:00 pm. The order list is prepared according to the 04:00 pm data. Order lists are compiled in the afternoon, during the peak period inside store is between 16:00 – 20:00. In our analysis, number of gaps is taken weekly and on a store by store basis. While this data is taken weekly, one stock keeping unit that is out of stock can be counted more than once as a gap, if that stock keeping unit is not replenished during a week period. Rather than give us information about how many different stock keeping units were out of stock, the data on number of gaps shows the total number of cases that retail store faced out of stock situation.

4.5.2. Outputs for Analysis

Outputs used in DEA and statistical analysis are number of SKUs sold, number of units sold, number of customers and sales. In the following parts, these outputs will be explained briefly.

4.5.2.1. Output 1: Number of SKUs Sold

Although number of SKUs displayed plays vital role in supporting retail store performance, it is also essential to assess the number of different stock keeping units sold. The data is provided by operations and support department and reveals how many different SKUs are sold as a proportion of those displayed. The data is provided weekly on a store by store basis.

4.5.2.2. Output 2: Number of Units Sold

The data is provided by the supply chain department. It reveals how many units were sold. For example, if the number of units sold in a week in store A is 50.000 units, it displays us that 50.000 units were sold and their barcodes were scanned from the check out points. If a consumer puts 5 items (1 can of coke, 3 mineral water (0.5 lt) and 1 bread) to the shopping trolley, the number of units sold is calculated as 5. The data is provided weekly and store by store. It is an important indicator to analyze sales levels.

4.5.2.3. Output 3: Number of Customers

The data is provided by operations support department. It is an important indicator to assess sales levels. The data is collected based on the number of receipts. It is provided weekly on a store by store basis.

4.5.2.4. Output 4: Sales

Nearly in each performance measurement approach, sales is a key indicator. Sales data is provided weekly store by store and by the supply chain department. Sales data is monitored and reported not only by supply chain department but also by the merchandise, marketing and assortment departments.

CHAPTER 5

ANALYSIS AND RESULTS

5.1. Retail Store Performance Measurement with DEA

As discussed before, the number of retail stores, called decision making units in DEA, is 33. A 52 week analysis for each DMU (33 retail stores) based on a total of ten variables (six inputs and four outputs) was performed to reveal the weekly performance of each retail store.

The main aim in conducting weekly analysis is to find answers for research questions 2 and 6, which are restated here: **Research question 2:** "Can resource based theory (RBT) be used in explaining retail store performance measurement results?" and **Research question 6:** "Does weekly analysis provide comprehensive managerial and theoretical insights?" It is essential to note that, research question two and six are exploratory.

The main aim of research question 2 is to address the literature gap in retail store performance measurement research. In the literature, the research in this field has provided more managerial insight and implications, but, on the other hand, tends to ignore related theories. Additionally, interpreting the retail store performance measurement through supply chain perspective was limited in literature. These deficiencies are the reason for research question 2. Findings in lights of research

question 2 will be considered in the discussion and conclusion chapters in theoretical contribution part.

Weekly analysis was performed to provide comprehensive managerial and theoretical insights. At least to my knowledge and as discussed in the literature review on retail store performance measurement, no weekly analysis has been conducted in retail store performance measurement with DEA. Most of the studies in retail store performance measurement with DEA was performed with a single data set, the reasons for this can be explained by the ease of working with one data set, and that a single data set is easy to acquire. Additionally, weekly analysis provides the opportunity for observing the changing pattern in the performance of retail stores.

DEA is performed with GAMS 22.8 program with CPLEX 10 solver, to measure the weekly performance of the retail stores. The corresponding GAMS code is available in the Appendix. As discussed in DEA section, VRS model is used to determine the performance level of DMUs.

While 10 variables were used to measure the performance of 33 DMUs in 52 weeks, 17160 cells were inserted to GAMS with related coding. In this sense, the total number of weights of inputs and outputs were also 17160. Additionally, for the inefficient DMUs, the desired input and output values were also reported as an outcome of the DEA. All of the weekly results are displayed in the Appendix (Weekly analysis results and each DMU's performance during 52 weeks). As this does not provide a sufficiently detailed insight to identify each week and DMU seperately, a summary of the findings will be discussed. There are two main

approaches for assessing the findings of DEA. Firstly, analyzing the efficiency levels of stores is necessary. Additionally, deeper analysis based on the inefficient DMUs is essential. Apart from these, a deeper examination of the weeks when stores operate inefficiently, and the assessment of the inputs and outputs weights of each DMU over the 52 weeks are useful. Thus, discussion will also include average efficiency of DMUs in 52 weeks, the DMU which has the lowest efficiency store, the week in which retail stores performed in least efficiency and input/output weights of each DMU during 52 weeks.

Regarding these, Figure 7 displays the average efficiency of DMUs in 52 weeks.

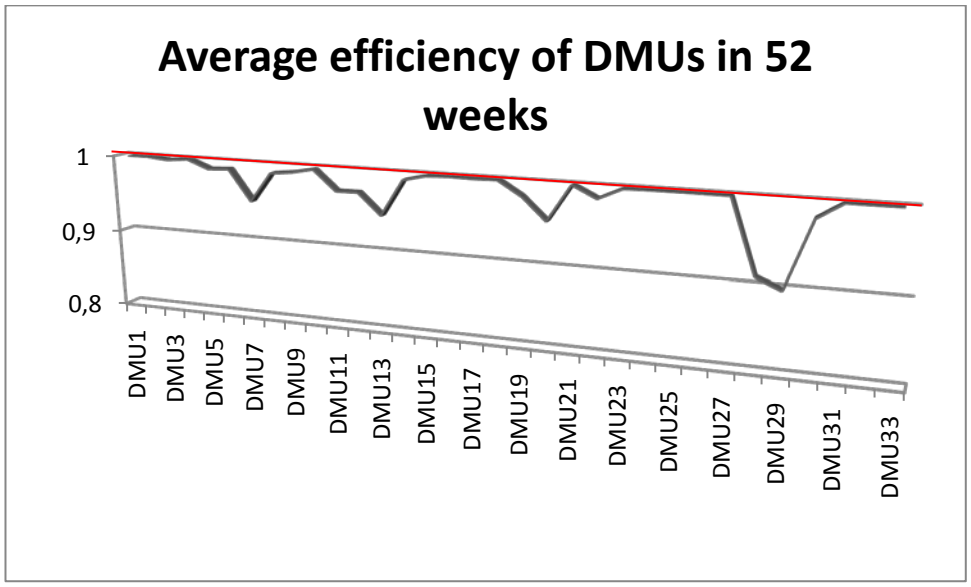

Figure 7 Average efficiency of DMUs in 52 weeks

The range for average efficiency of all DMUs in 52 weeks is between .8974 - 1. According to the figure, DMU 29 has the lowest efficiency level, 0.89741. The managerial point of view verifies that this DMU has some problems (e.g. low sales level, less customers than expected level) and does not operate efficiently.

Improvement is needed not only in this DMU, but also in others that do not operate efficiently.

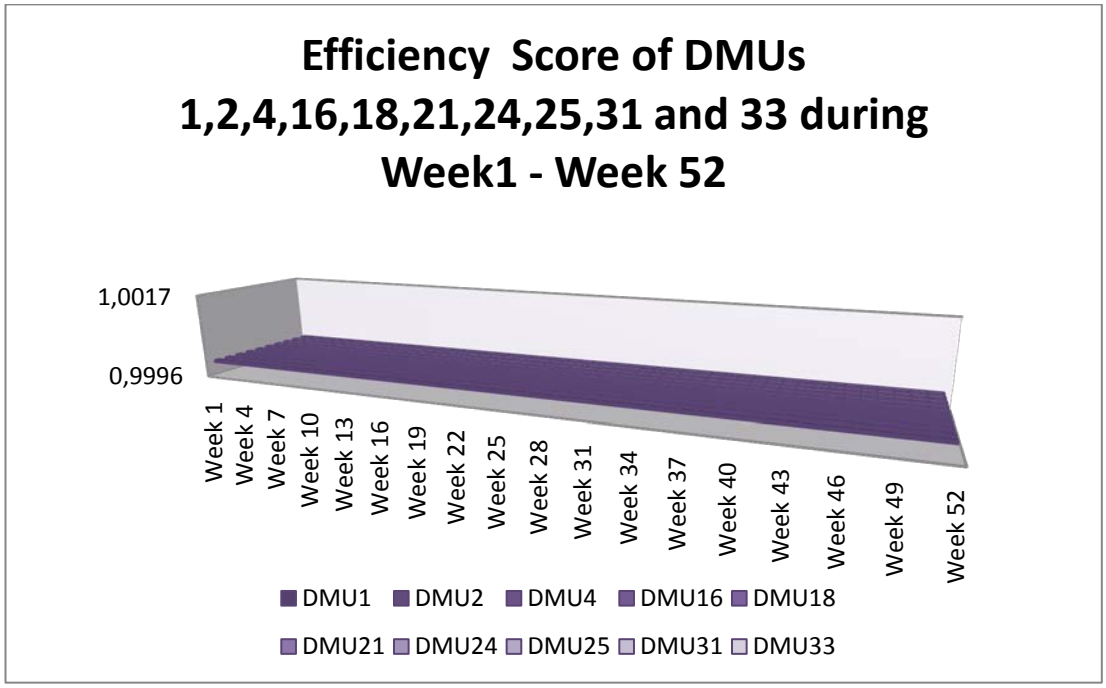

Figure 8 Efficient DMUs during 52 weeks (DMU 1, 2, 4, 16, 18, 21, 24, 25, 31 and 33)

It is important to note that not each DMU experiences an inefficiency problem. DMU 1, 2, 4, 16, 18, 21, 24, 25, 31 and 33 are efficient (efficiency value is 1) over a 52 weeks time period. The efficiency result of these DMUs are in accordance with expectations as expressed in meetings with management. Regarding to their performance evaluation (from retailer point of view; sales is accepted as the most important performance indicator), these DMUs all operate efficiently. It is essential to mention that a retailer is output oriented efficient if it is not possible to increase any of its output levels without decreasing at least another one of its output levels or without increasing at least one of its input levels (Barros, 2006). This condition is valid for DMU 1, 2, 4, 16, 18, 21, 24, 25, 31 and 33. These DMUs operated as efficient units during 52 weeks.

On the other hand, if average efficiency levels of DMUs over 52 weeks is considered, it is observed that among all 33 DMUs, DMU 29 has the lowest average efficiency score. Over 52 weeks, thus, a deeper analysis on DMU 29 is displayed below. In this sense, the efficiency level of this DMU during 52 weeks is presented in Figure 9.

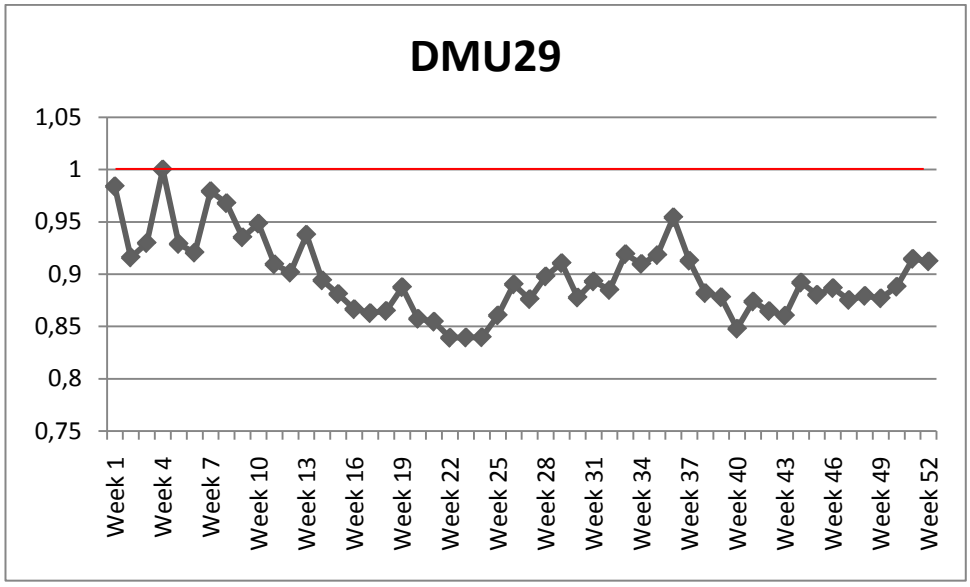

Figure 9 Efficiency score of DMU 29 during 52 weeks

Average efficiency of DMU 29 over 52 weeks is 0.89741, with the lowest efficiency score, 0.83929, in Week 22. DMU 29 should assess its inputs and outputs in the weeks that it does not operate efficiently. For instance, to operate as an efficient unit, DMU 29 should increase its outputs (in units) and decrease its inputs (in units) in Week 22, as follows:

Table 17 Reducible and Increaseable Units of DMU 29 in Week 22

DMU 29/Week 22	**Decrease (in units)**		**Increase (in units)**
Input 1 (Number of SKUs displayed)	4,276.447	Output 1 (Number of SKUs Sold)	560.2061
Input 2 (Number of Check out Points)	6.221568	Output 2 (Number of Units Sold)	29,803.19
Input 3 (Number of FTE)	27.7925	Output 3 (Number of customer)	616.1234
Input 4 (Shelf capacity)	5.459567	Output 4 (Sales)	98,916.96
Input 5 (Delivery frequency)	0.963453		
Input 6 (Number of gaps)	391.9648		

It is also useful to evaluate the efficiency levels of DMUs on a weekly basis. In this sense, the efficiency levels of 33 DMUs is at the lowest level in Week 21. The related efficiency figure is displayed below.

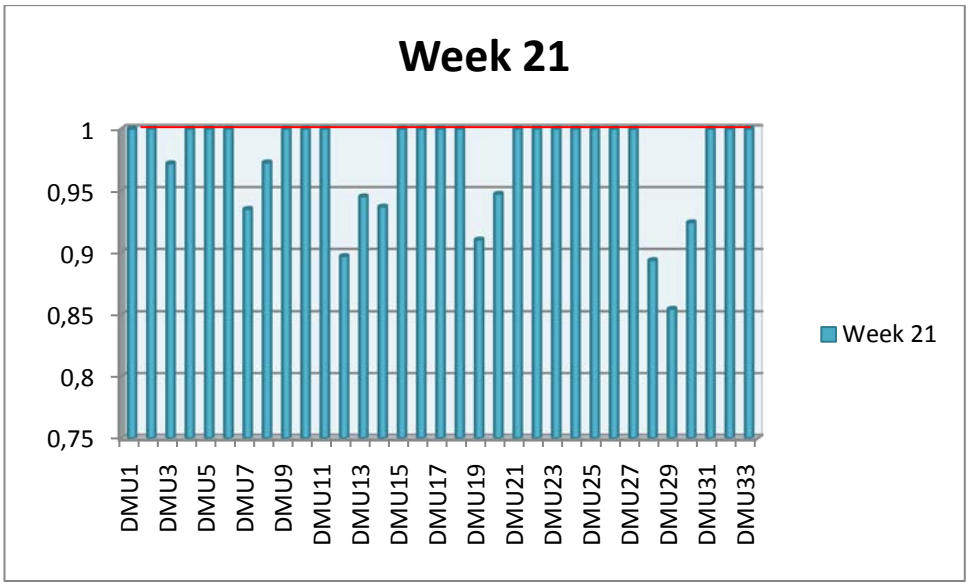

Figure 10 Efficiency Scores of DMUs in Week 21

In week 21; DMU 1, 2, 4, 5, 6, 9, 10, 11, 15, 16, 17, 18, 21, 22, 23, 24, 25, 26, 27, 31 and 33 are efficient whereas all other DMUs are inefficient. The lowest efficiency score in Week 21 is 0.854653, for DMU 29. Average efficiency of all DMUs in week 21 is 0.975399. The inefficient DMUs should reconsider their inputs and outputs in order to become efficient units. Hence, decrease in inputs and increase in outputs should be determined. When decrease level in inputs and increase level in outputs table are examined, the results can be summarized as follows: Input 1 (number of SKUs displayed) should be decreased in DMU 3, 7, 8, 12, 13, 14, 19, 20, 28, 29 and 30. Input 2 (number of check out points) has to be decreased in DMU 3, 7, 8, 12, 13, 14, 19, 20, 28, 29 and 30. Input 3 (FTE) should be lessened in DMU 3, 7, 8, 12, 13, 14, 19, 20, 28, 29 and 30. Input 4 (shelf capacity) can be reduced in DMU 3, 7, 8, 12, 13, 14, 19, 20, 28, 29 and 30. Input 5 (delivery frequency) can be decreased in DMU 3, 7, 8, 12, 13, 14, 19, 20, 28, 29 and 30. Input 6 (number of gaps) should be reduced in DMU 3, 7, 8, 12, 13, 14, 19, 20, 28, 29 and 30. Output 1 (number of skus sold) should be enhanced in DMU 28 and 29. Output 2 (number of units sold) can be

increased in DMU 3, 7, 8, 12, 13, 14, 19, 20, 28, 29 and 30. Output 3 (number of customers) can be enhanced in DMU 7, 8, 19, 20 and 30. Output 4 (sales) can be increased in DMU 3, 7, 8, 12, 13, 14, 19, 20, 28 and 30. According to the trade plan, in week 21 there was no price reduction applied to any product category.

According to trade plan of 2009- 2010, there were price reductions in product categories in all except 5 weeks. Different price reductions were applied in different product categories in the other 47 weeks.

As stated before, input and output weights of each DMU in each week is reported in the DEA. However, discussing each input and output weight based on each DMU for each week does not provide comprehensive insight, although 17160 different values are determined as the outcome of the analysis. Therefore, in the following parts, there will be comprehensive analysis based on the inputs and outputs weights along weeks and among DMUs. The following analysis reveals the relative importance of inputs and outputs along different DMUs over 52 weeks.

While standard deviation shows how much variation there is from the average, to provide meaningful results based on input and output weights, standard deviation of input and output weights for each DMU in 52 weeks will be presented in the following sections. This was performed to evaluate the importance and differentiation of each input/output weights along weeks. Below, standard deviation of each input/output weight among weeks for each DMU and standard deviation of each input/output weight among weeks are presented.

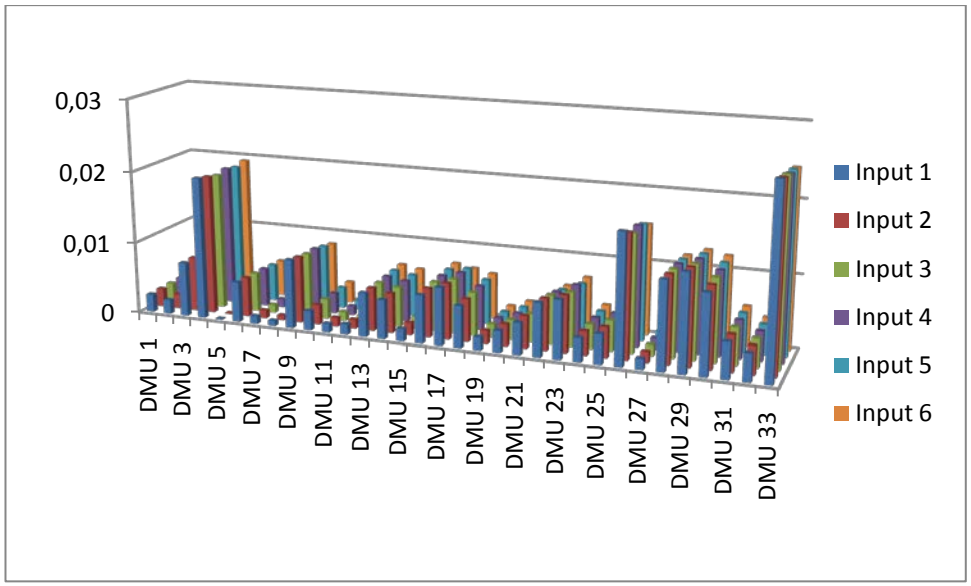

Figure 11 Standard deviation of weights of inputs among DMUs during 52 weeks

As can be observed from the figure, although the range of standard deviation of input weights differ among DMUs, the importance of each input to measure the performance of each retail store is similar. Regarding this, it can be inferred that the inputs selected for retail store performance measurement are valid for performance measurement.

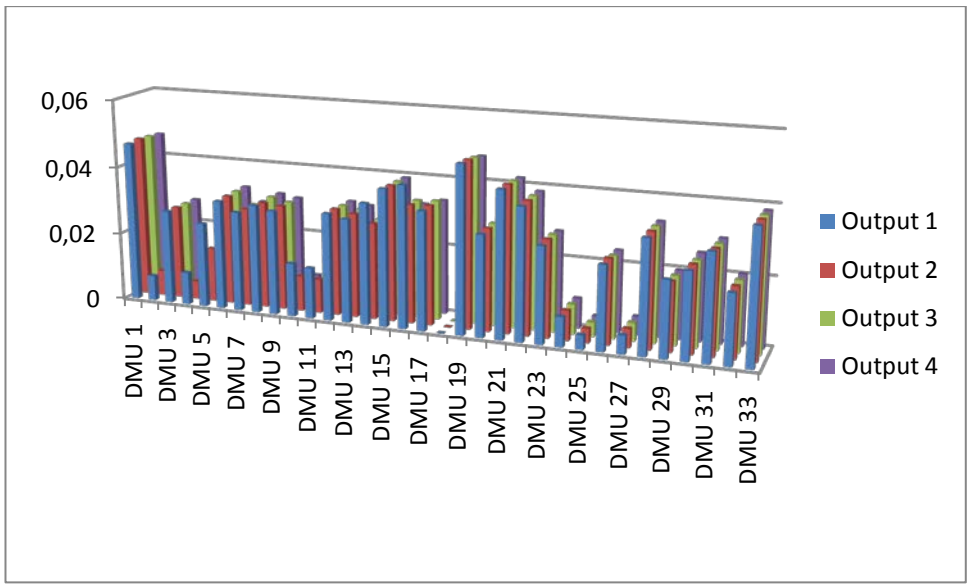

Figure 12 Standard deviation of weights of outputs among DMUs during 52 weeks

As can be observed from the figure, although the range of standard deviation of output weights differ among DMUs, the importance of each output measuring the performance of each retail store is similar, thus suggesting that the outputs selected for performance retail store measurement are valid for performance measurement.

5.2. Statistical Analysis

The number of units to be analyzed through statistical analysis is 33. All statistical tests were run with SPSS version 17. Regarding the content of the research, multiple regression and correlation analyses are conducted. (e.g. Kamanli, 2004). First of all, Kolmogorov-Smirnov test is performed to check the normality of data. In thise sense, number of SKUs sold, number of units sold, number of customers, sales, number of SKUs displayed, number of check out points, number of FTE, shelf capacity, number of gaps, delivery frequency, and population in 5 km radius variables are tested for normality. In Kolmogorov-Smirnov statistic, a non-significant result (s,g. value of more than .05) indicates normality (Pallant, 2007). All of the variables values that are written above are more than .05, indicating normality. In this sense, we can apply parametric tests of multiple regression and correlation.

Multiple regression and correlation analyses are performed to answer research questions 3, 4 and 5. It is necessary to note that population in 5 km radius is just used in statistical analyses not in DEA. The main reason for selecting this variable is because of its interaction to predict number of SKUs sold and sales. In DEA, the

performance of the retail store is measured with the non-categorical variables. While population in 5 km radius is a categorical variable, it is not used in DEA.

5.2.1. Multiple Regression

With the selected variables from literature and to reflect supply chain perspective, there will be two multiple regression analyses based on previous studies held in this scope (e.g. Kamanli, 2004). Number of SKUs sold and sales were chosen as dependent variables to be predicted with different independent variables. For the multiple regression analyis, significance level is determined as .05.

5.2.1.1. Multiple Regression for Number of SKUs Sold

The number of different SKUs sold in each retail store is an important indicator for the performance of retail stores. In the retail industry, there are numerous stock keeping units displayed, however SKU unit analysis is needed to identify which are more frequently purchased. In a hypermarket, approximately 25.000 SKUs are displayed. Change in number of SKUs sold are likely to be explained by the number of FTE, shelf capacity, delivery frequency, number of SKUs displayed and population in 5 km. In order to use multiple regression, it is not recommended to use highly correlated variables, researchers should not use any variable that has more than r= .7 correlation coefficient. To check this, inter item correlation is performed. Regarding the inter-item correlation results, all of the selected variables are used to predict number of SKUs sold. Figure 13 displays model of multiple regression for number of SKUs sold.

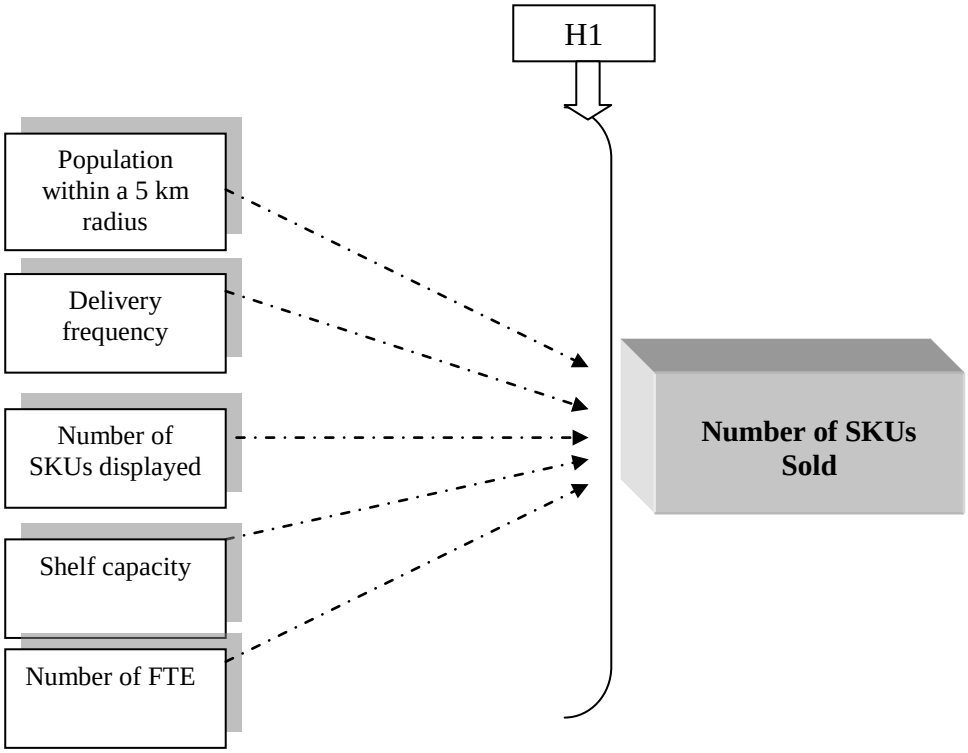

Figure 13 Model for Multiple Regression of Number of SKUs Sold

Other assumptions in the performance of multiple regression analyses are checking outliers, normality, linearity, homoscedasticity and independence of residuals. All these assumptions were checked for multiple regression and in the light of the assumptions accordance, multiple regression was performed.

In this content, tolerance is an indicator of how much of the variability of the specified independent is not explained by the other independent variables in the model, if this value is very small (less than .10), it indicates that that multiple correlation with other variables is high, suggesting the possibility of multicollinearity. The other value given is the VIF (Variance inflation factor), which is the inverse of the Tolerance value (1 divided by Tolerance). VIF values above 10 would be a

problem here, indicating multicollinearity (Pallant,2007). Tolerance value belonging to FTE, shelf capacity, delivery frequency, number of skus displayed and population in 5 km radius is less than .10. Apart from this VIF values of variables are also less than 10, indicating no problem on the application of multiple regression.

In order to answer research question 4, determined as **"**Can the number of SKUs sold be predicted by the following variables: population within a 5 km radius, delivery frequency, number of SKUs displayed, shelf capacity and FTE?", multiple regression for number of SKUs sold was performed. Thus, Hypothesis 1 is as follows: Number of SKUs sold is predicted by population within a 5 km radius, delivery frequency, number of SKUs displayed, shelf capacity and FTE.

The Enter method is used in multiple regression. The signifance level is at the level of .05.

Table 18 Variables Entered in Multiple Regression for Number of SKUs Sold

Model	Variables Entered	Variables Removed	Method
1	Population_5km, Delivery frequency, Number of SKUs displayed, Shelf capacity, FTE[a]	.	Enter

a. All requested variables entered.

Table 19 Model Summary for Multiple Regression of Number of SKUs Sold

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.948[a]	.899	.880	835.36273

a. Predictors: (Constant), Population_5km, Delivery frequency, Number of SKUs displayed, Shelf capacity, FTE

Table 20 ANOVA table for dependent variable of number of SKUs Sold[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1,674E8	5	3,348E7	47,973	,000[a]
	Residual	1,884E7	27	697830,889		
	Total	1,862E8	32			

a. Predictors: (Constant), Population_5km, Deliveryfrequency, Numberofskusdisplayed, Shelfcapacity, FTE, *b. Dependent Variable: Numberofskussold*

In the light of the multiple regression table, although only the variables of number of FTE and shelf capacity are enough to explain the variance (.899) in Number of SKUs sold, Hypothesis 1 is accepted. In this sense, we do not need to use population in 5km radius, number of SKUs displayed and delivery frequency to predict number of SKUs sold. This result has also discussed with the executives, who confirmed the fact that FTE and shelf capacity are the main determinants in forecasting the number of SKUs sold.

Here, supply chain perspective is based on determining the shelf capacity and the number of FTE. Determining the approriate shelf capacity area is possible through the accurate prediction of the number of SKUs to be sold and arranging the related supply chain activities to fill the shelves with the determined products in a timely manner.

Table 21 Coefficients of Number of SKUs Sold[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-1375.748	2217.309		-0.62	0.54
	FTE	30.366	4.585	0.691	6.623	0
	Shelfcapacity	149.438	66.207	0.224	2.257	0.032
	Deliveryfrequency	252.013	165.646	0.114	1.521	0.14
	Numberofskusdisplayed	0.12	0.071	0.133	1.7	0.101
	Population_5km	-0.003	0.002	-0.136	-1.918	0.066

a. Dependent Variable: Numberofskussold

According to multiple regression results, .899 of the variance in Number of SKUs sold can be explained with the independent variables which are FTE and shelf capacity. In this sense, the multiple regression equation will be as follows:

$$Y = -1375.748 + X1 * 30{,}366 + X2 * 149.438$$

where Y = number of SKUs sold

X_1 = FTE

X_2 = Shelf capacity

5.2.1.2. Multiple Regression for Sales

Sales is a very important performance indicator regardless of the industry that the company operates in. It has also strong role in the assessment of the performance of the retail store. In the light of the studies in this field and meetings with executives of the retailer, the number of SKUs displayed, shelf capacity, number of FTE, number of gaps, number of customers, delivery frequency, number of check out points, population in 5 km radius, number of skus sold, and number of units sold were determined as the variables for predicting sales levels. In order to use multiple regression, it is not recommended to use highly correlated variables. Researchers

should not use any variable that has more than r=.7 correlation (Pallant, 2007). To check this, inter item correlation was performed. The significance level is determined as .05. According to inter item correlation results, there is a strong correlation between number of skus sold, number of units sold, FTE, shelf capacity, number of customers, number of check out points and number of gaps. Therefore, it was decided to reperform the inter item correlation analysis by removing (while the inter item correlation is more than r=.7) number of skus sold, number of customers, FTE, number of check out points and number of gaps.

According to the inter item correlation results, when sales is chosen as a dependent variable, the number of units sold, number of SKUs displayed, shelf capacity, delivery frequency and population in 5 km radius can be used as independent variables. Thus, the following research question is written (research question 5) “Can sales be predicted by the following variables: population within a 5 km radius, delivery frequency, number of SKUs displayed, shelf capacity and number of units sold?”
Figure 14 displays the model for multiple regression for sales.

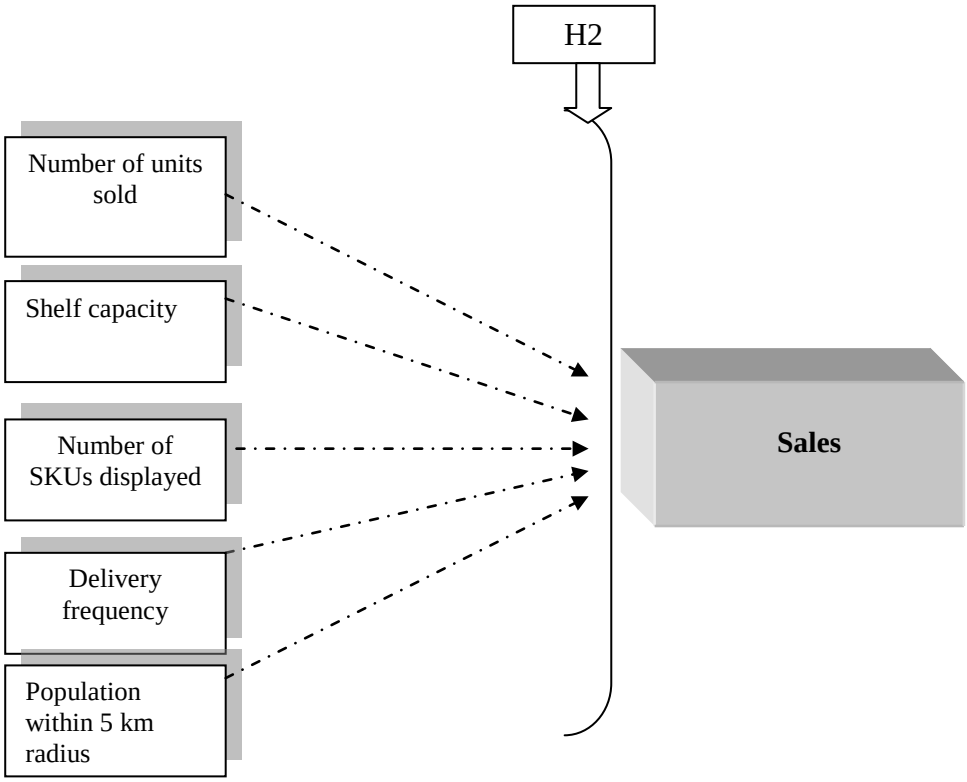

Figure 14 Model for Multiple Regression of Sales

Before applying multiple regression for sales, assumptions of multiple regression were checked. Hence, tolerance and variance inflation factor (VIF) are considered. Tolerance is an indicator of how much of the variability of the specified independent is not explained by the other independent variables in the model. If this value is very small (less than .10), it indicates that that multiple correlation with other variables is high, suggesting the possibility of multicollinearity. The other value given is the VIF (Variance inflation factor), which is the exact inverse of the Tolerance value (1 divided by Tolerance). VIF values above 10 would be a problem here indicating multicollinearity (Pallant, 2007). Tolerance value belonging to number of units sold, number of skus displayed, shelf capacity, delivery frequency and population in 5 km radius are not less than .10. Apart from this VIF values of variables are also less than 10, indicating no problem on the application of multiple regression.

Other assumptions in the performance of multiple regression analyses are checking outliers, normality, linearity, homoscedasticity and independence of residuals. All of the assumptions are checked for multiple regression and in lights of the assumptions accordance, multiple regression is performed.

In order to answer research question 5 which is determined as, **"**Can sales be predicted by the following variables: population within a 5 km radius, delivery frequency, number of SKUs displayed, shelf capacity and number of units sold?", Multiple regression for number of SKUs sold was performed. In this sense, Hypothesis 2 is written as follows: Sales is predicted by population within a 5 km radius, delivery frequency, number of SKUs displayed, shelf capacity and number of units sold. The Enter method is used in multiple regression. The signifance level is .05.

Table 22 Variables Entered in Multiple Regression for Sales

Model	Variables Entered	Variables Removed	Method
1	Population within 5km radius, Delivery frequency, Number of skus displayed, Shelf capacity, Number of units sold[a]	.	Enter

a. All requested variables entered.

Table 23 Model Summary for Multiple Regression of Sales

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.995[a]	.990	.989	48876.94409

a. Predictors: (Constant), Population_5km, Deliveryfrequency, Numberofskusdisplayed, Shelfcapacity, Numberofunitssold

Table 24 ANOVA Table for Dependent Variable of Sales

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	6.624E12	5	1.325E12	554.581	.000[a]
	Residual	6.450E10	27	2.389E9		
	Total	6.689E12	32			

a. Predictors: (Constant), Population_5km, Deliveryfrequency, Numberofskusdisplayed, Shelfcapacity, Numberofunitssold

b. Dependent Variable: Sales

Table 25 Coefficients of Sales

Model		**Unstandardized Coefficients**		**Standardized Coefficients**		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	5967.036	134980.771		.044	.965
	Number of units sold	3.645	.114	.995	31.952	.000
	Number of skus displayed	-3.462	4.150	-.020	-.834	.411
	Shelf capacity	2229.608	3731.088	.018	.598	.555
	Delivery frequency	-709.721	10075.586	-.002	-.070	.944
	Population in 5km radius	-.010	.090	-.002	-.107	.916

a. Dependent Variable: Sales

In the light of the multiple regression table, although only variable of number of units sold is sufficient to explain the variance (.990 of variance) in sales, Hypothesis 2 is accepted. Thus, we do not need to use population in 5km radius, number of SKUs displayed, delivery frequency or shelf capacity to predict sales. This result was also discussed with the executives, who revealed the fact that number of units sold is the main determinant to predict sales.

Sales is among one of the most important performance indicator. In order predict the sales levels, the number of units sold can be used. It should be noted that the number of units sold is impacted by on shelf availability, the number of SKUs displayed and efficient labor usage. The retail chain members have to be aware of their impact on sales and perform accordingly.

According to multiple regression results, .989 of the variance in sales can be explained with the independent variable, the number of units sold. In this sense, the multiple regression equation will be as follows:

$$Y = 5967.036 + X1 * 3.645$$

where Y = sales

X_1 = Number of units sold

5.3. Correlation Analysis

Among of the six research questions, research question three is “To what extent are inputs used in retail store performance assessment related to outputs?”. In order to answer this research question, the following correlation analyses were performed. All the correlation analyses were held at the significance level of .01. To reveal the extension between inputs with the outputs, there were 24 correlation analyses conducted (due to usage of 6 inputs and 4 outputs for retail store performance). Correlation analyses held are as follows: (Correlation between)

- shelf capacity and number of SKUs sold,
- delivery frequency and number of SKUs sold,
- number of SKUs displayed and number of SKUs sold,
- number of FTE and number of SKUs sold
- number of gaps and number of SKUs sold,
- number of check out points and number of SKUs sold,
- shelf capacity and number of units sold,
- delivery frequecny and number of units sold,
- number of skus displayed and number of units sold,
- number of FTE and number of units sold,
- number of gaps and number of units sold,
- number of check out points and number of units sold,
- shelf capacity and sales,
- delivery frequency and sales,
- number of SKUs displayed and sales,

- number of FTE and sales,
- number of gaps and sales,
- number of check out points and sales,
- shelf capacity and number of customers,
- delivery frequency and number of customers,
- number of SKUs displayed and number of customers,
- number of FTE and number of customers,
- number of gaps and number of customers,
- number of check out points and customers.

The related correlation tables and results are presented below in accordance with the given above sequence.

In order to answer research question 3, a single hypothesis is not enough. Therefore, a related hypothesis is proposed for each correlation test to reveal the relation between inputs and outputs. (Hypothesis 3 –Hypothesis 26 is written in accordance with research question 3)

Before conducting correlation analysis, the preliminary analyses were performed, i.e. checking for outliers and the distribution of data points (Pallant, 2007). None of the preliminary analyses revealed a barrier to conducting correlation analyses for the selected variables, therefore the following correlation analysis were performed.

5.3.1. Correlation Analysis to Reveal the Relation of Inputs to Output 1

The correlation analyses are held in four groups. Each group of correlation consists of six inputs and one output. In the first group, correlation between six inputs to number of SKU sold (output 1) is conducted seperately. Figure 15 displays the relation of inputs to output 1 and the related hypotheses.

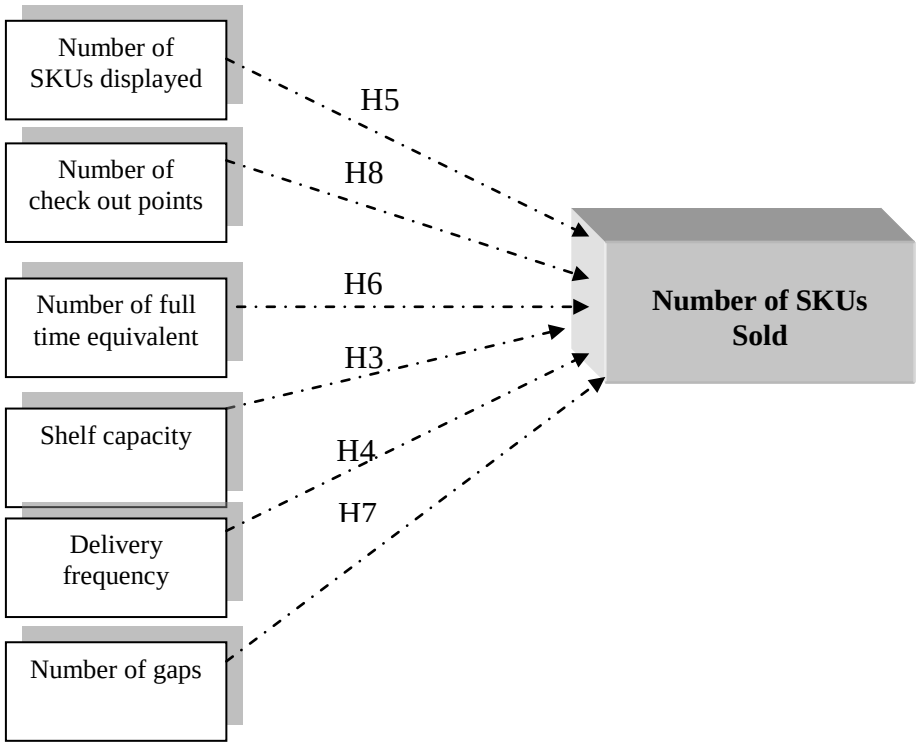

Figure 15 Model of Relation of Inputs to Output 1

Table 26 Correlation between shelf capacity and number of SKUs sold

		Shelf capacity	Number of SKUs sold
Shelf capacity	Pearson Correlation	1	.762**
	Sig. (2-tailed)		.000
	N	33	33
Number of SKUs sold	Pearson Correlation	.762**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 3: Shelf capacity is positively associated with number of SKUs sold.

According to the correlation Table 26, it can be observed that there is a positive relationship between shelf capacity and number of SKUs sold (r=.762). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H3 is accepted.

According to the correlation results, it can be observed that when shelf capacity increases, the number of SKUs sold will also tend to increase. It is foreseen that, an increase in shelf capacity is likely to increase number of SKUs displayed. As a result of this, increases in number of SKUs displayed will lead to an increase in the number of SKUs sold. In brief, it is revealed that greater shelf capacity is likely to generate a greater number of SKUs sold.

Table 27 Correlation between delivery frequency and number of SKUs sold

		Delivery frequency	Number of SKUs sold
Delivery frequency	Pearson Correlation	1	.524**
	Sig. (2-tailed)		.002
	N	33	33
Number of SKUs sold	Pearson Correlation	.524**	1
	Sig. (2-tailed)	.002	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 4: Delivery frequency is positively associated with number of SKUs sold.

According to the correlation Table 27 , it can be observed that there is a positive relationship between delivery frequency and number of SKUs sold (r=.524). The correlation is significant at the .01 significance level (p=.002). Regarding these values, H4 is accepted. Correlation results reveal that delivery frequency has a positive association with the number of SKUs sold.

Table 28 Correlation between number of SKUs displayed and number of SKUs sold

		Number of SKUs displayed	Number of SKUs sold
Number of SKUs displayed	*Pearson Correlation*	*1*	*.595***
	Sig. (2-tailed)		*.000*
	N	*33*	*33*
Number of SKUs sold	*Pearson Correlation*	*.595***	*1*
	Sig. (2-tailed)	*.000*	
	N	*33*	*33*

*** Correlation is significant at the 0.01 level (2-tailed).*

Hypothesis 5: Number of SKUs displayed is positively associated with number of SKUs sold.

According to the correlation Table 28 , it can be observed that there is a positive relationship between number of SKUs displayed and number of SKUs sold (r=.595). The correlation is significant at the .01 significance level (p=.000). Regarding to these values, H5 is accepted.

In the light of the results, it can be observed that in the case of an increase in the number of SKUs displayed, the number of SKUs sold will also increase.

Table 29 Correlation between number of FTE and number of SKUs sold

		Number of FTE	**Number of SKUs sold**
Number of FTE	Pearson Correlation	1	.921**
	Sig. (2-tailed)		.000
	N	33	33
Number of SKUs sold	Pearson Correlation	.921**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 6: Number of FTE is positively associated with number of SKUs sold.

According to the correlation Table 29, it can be observed that there is a positive relationship between number of FTE and number of SKUs sold (r=.921). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H6 is accepted.

According to the correlation results, it can be observed that in the case of an increase in the number of FTE, the number of SKUs sold will also increase. This result can

be evaluated as more personnel leading to a more desirable level of service, and this positively impacts the number of SKUs sold.

Table 30 Correlation between number of gaps and number of SKUs sold

		Number of Gaps	Number of SKUs sold
Number of Gaps	Pearson Correlation	1	.724**
	Sig. (2-tailed)		.000
	N	33	33
Number of SKUs sold	Pearson Correlation	.724**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 7: Number of gaps is negatively associated with number of SKUs sold.

According to the correlation Table 30 , it can be observed that there is a positive relationship between number of gaps and number of SKUs sold (r=.724). Although, correlation is significant at the .01 significance level (p=.000), while the hypothesis is based on negative association between the variables, H7 is rejected. Under normal circumstances, it is estimated that number of gaps will negatively impact the number of SKUs sold. Conversely, this result can be evaluated regarding the fact that approximately 25.000 SKUs are displayed in a hypermarket. However, according to this finding the number of gaps do not occur from the frequently sold items and the number of gaps are not sufficiently high to impact the number of SKUs sold. Additionally, it is very common that when the customers face an out of stock situation, they can possibly convert to another brand or prefer to buy the substitute SKU.

Table 31 Correlation between number of check out points and number of SKUs sold

		Number of check out points	Number of SKUs sold
Number of check out points	Pearson Correlation	1	.798**
	Sig. (2-tailed)		.000
	N	33	33
Number of SKUs sold	Pearson Correlation	.798**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 8: Number of check out points is positively associated with number of SKUs sold.

According to the correlation Table 31, it can be observed that there is a positive relationship between number of check-out points and number of SKUs sold (r=.798). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H8 is accepted.

Regarding this finding, the number of check out points has a positive impact on the number of SKUs sold.

5.3.2. Correlation Analysis to Reveal the Relation of Inputs to Output 2

In the second group, correlation between six inputs to number of units sold (output 2) is conducted seperately. Figure 16 displays the relation of inputs to output 2 and the related hypotheses.

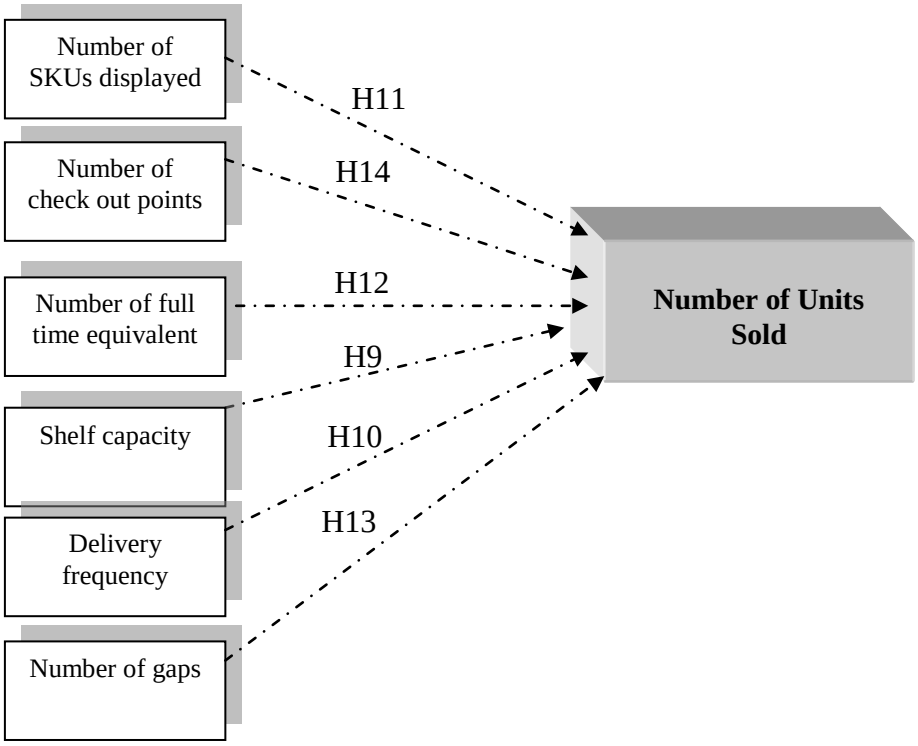

Figure 16 Model of Relation of Inputs to Output 2

Table 32 Correlation between shelf capacity and number of units sold

		Shelf capacity	Number of units sold
Shelf capacity	Pearson Correlation	1	.668**
	Sig. (2-tailed)		.000
	N	33	33
Number of units sold	Pearson Correlation	.668**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 9: Shelf capacity is positively associated with number of units sold.

According to the correlation Table 32, it can be observed that there is a positive relationship between shelf capacity and number of units sold (r=.668). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H9 is accepted.

According to the correlation results, it can be observed that in the case of an increase in shelf capacity, the number of units sold is likely to increase. This result can be evaluated as more shelf capacity enabling a greater number of SKUs to be displayed, and wider range of SKUs can lead to more units being sold.

Table 33 Correlation between delivery frequency and number of units sold

		Delivery frequency	**Number of units sold**
Delivery frequency	Pearson Correlation	1	.564**
	Sig. (2-tailed)		.001
	N	33	33
Number of units sold	Pearson Correlation	.564**	1
	Sig. (2-tailed)	.001	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 10: Delivery frequency is positively associated with number of units sold.

According to the correlation Table 33, it can be observed that there is a positive relationship between delivery frequency and number of units sold (r=.564). The correlation is significant at the .01 significance level (p=.001). Regarding these values, H10 is accepted.

According to the correlation results, it can be observed that in the case of an increase in delivery frequency, it is expected that on-shelf availability will be higher, and this will lead to a greater number of units being sold.

Table 34 Correlation between number of SKUs displayed and number of units sold

		Number of SKUs displayed	**Number of units sold**
Number of SKUs displayed	Pearson Correlation	1	.493**
	Sig. (2-tailed)		.004
	N	33	33
Number of units sold	Pearson Correlation	.493**	1
	Sig. (2-tailed)	.004	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 11: Number of SKUs displayed is positively associated with number of units sold.

According to the correlation table 34, it can be observed that there is a positive relationship between number of SKUs displayed and number of units sold (r=.493). The correlation is significant at the .01 significance level (p=.004). Regarding these values, H11 is accepted.

By taking into consideration the values in correlation analysis, when number of number SKUs displayed increases, number of units sold will also tend to increase. Management support the view that more displayed SKUs in the retail store will lead to an increase in the number of units sold. Customers will find more SKUs in the categories, and will tend to buy more.

Table 35 Correlation between number of FTE and number of units sold

		Number of FTE	Number of units sold
Number of FTE	Pearson Correlation	1	.986**
	Sig. (2-tailed)		.000
	N	33	33
Number of units sold	Pearson Correlation	.986**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 12: Number of FTE is positively associated with number of units sold.

According to the correlation Table 35, it can be observed that there is a positive relationship between number of FTE and number of units sold (r=.986). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H12 is accepted.

When number of FTE increases, number of units sold is expected to increase as well. The management support the view that more personnel in the retail store will an lead to increase in the number of units sold. Customers will find more personnel inside the store to consult and get help and as a result of this they will tend to buy more.

Table 36 Correlation between number of gaps and number of units sold

		Number of gaps	Number of units sold
Number of gaps	Pearson Correlation	1	.744**
	Sig. (2-tailed)		.000
	N	33	33
Number of units sold	Pearson Correlation	.744**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 13: Number of gaps is negatively associated with number of units sold.

According to the correlation Table 36, it can be observed that there is a positive relationship between number of gaps and number of units sold (r=.744). Although, correlation is significant at the .01 significance level (p=.000), because the hypothesis is based on negative association between the variables, H13 is rejected.

Under normal circumstances, it is estimated that the number of gaps will negatively impact the number of units sold. This finding can be explained by reasons previously stated in the evaluation of correlation between number of gaps and number of SKUs sold. To highlight these once more, hypermarkets display approximately 25.000 SKUs. However, gaps are less likely to occur in the more frequently sold items, and the number of gaps is unlikely to reach a level that will significantly affect number of units sold. Additionally, it is very common that when the customers face an out of stock situation, they can possibly convert to another brand or prefer to buy the substitute SKU.

Table 37 Correlation between number of check out points and number of units sold

		Number of check out points	Number of units sold
Number of checkout points	Pearson Correlation	1	.822**
	Sig. (2-tailed)		.000
	N	33	33
Number of units sold	Pearson Correlation	.822**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 14: Number of check out points is positively associated with number of units sold.

According to the correlation Table 37, it can be observed that there is a positve relationship between number of check out points and number of units sold (r=.822). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H14 is accepted.

As the number of check-out points increases, the number of units sold is also expected to increase.

5.3.3. Correlation Analysis to Reveal the Relation of Inputs to Output 3

In the third group, correlation between six inputs to sales (output 3) is conducted seperately. Figure 17 displays the relation of inputs to output 3 and the related hypotheses.

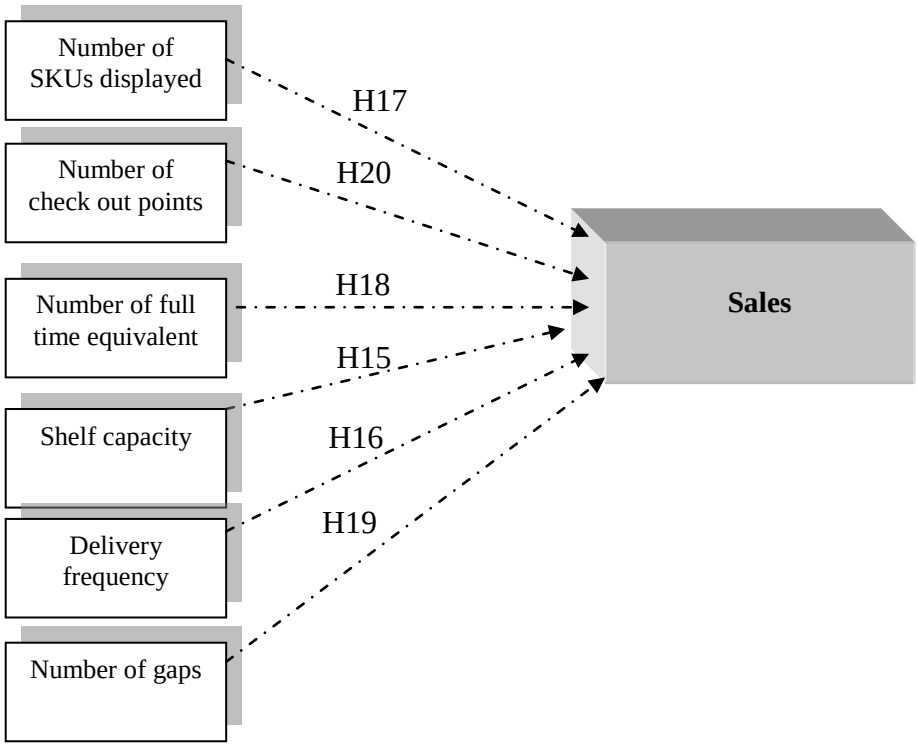

Figure 17 Model of Relation of Inputs to Output 3

Table 38 Correlation between shelf capacity and sales

		Shelf capacity	Sales
Shelf capacity	Pearson Correlation	1	.669**
	Sig. (2-tailed)		.000
	N	33	33
Sales	Pearson Correlation	.669**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 15: Shelf capacity is positively associated with sales.

According to the correlation Table 38, it can be observed that there is a positive relationship between shelf capacity and sales (r=.669). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H15 is accepted.

As shelf capacity increases, it is expected that more SKUs can be displayed. As a result, this leads to increased sales.

Table 39 Correlation between delivery frequency and sales

		Delivery frequency	Sales
Delivery frequency	Pearson Correlation	1	.557**
	Sig. (2-tailed)		.001
	N	33	33
Sales	Pearson Correlation	.557**	1
	Sig. (2-tailed)	.001	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 16: Delivery frequency is positively associated with sales.

According to the correlation Table 39, it can be observed that there is a positive relationship between delivery frequency and sales. There is a high level of relationship between these two variables (r=.557). The correlation is significant at the .01 significance level (p=.001). Regarding these values, H16 is accepted. When delivery frequency increases, it is expected that this will positively impact sales levels.

Table 40 Correlation between number of SKUs displayed and sales

		Number of SKUs displayed	Sales
Numberof SKUs displayed	Pearson Correlation	1	.479**
	Sig. (2-tailed)		.005
	N	33	33
Sales	Pearson Correlation	.479**	1
	Sig. (2-tailed)	.005	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 17: Number of SKUs displayed is positively associated with sales.

According to the correlation Table 40, it can be observed that there is a positive relationship between number of SKUs displayed and sales (r=.479). The correlation is significant at the .01 significance level (p=.005). Regarding these values, H17 is accepted.

This finding can be interpreted as indicating that an increase in the number of SKUs displayed will probably increase sales levels. This view is supported by the management that higher number of SKUs displayed in the retail store will lead to increase in the sales. Evidence for this is based on the fact that the retail stores that display a higher number of SKUs, have higher sales levels.

Table 41 Correlation between number of FTE and Sales

		Number of FTE	Sales
Number of FTE	Pearson Correlation	1	.979**
	Sig. (2-tailed)		.000
	N	33	33
Sales	Pearson Correlation	.979**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 18: Number of FTE is positively associated with sales.

According to the correlation Table 41, it can be observed that there is a positive relationship between number of FTE and sales (r=.979). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H18 is accepted. According to the correlation table, an increased number of FTE is expected to positively impact sales levels

Table 42 Correlation between number of gaps and sales

		Number of gaps	Sales
Number of gaps	Pearson Correlation	1	.756**
	Sig. (2-tailed)		.000
	N	33	33
Sales	Pearson Correlation	.756**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 19: Number of gaps is negatively associated with sales.

According to the correlation Table 42, it can be observed that there is a positive relationship between number of gaps and sales. There is a high level of relationship

between two variables (r=.756). Although correlation is significant at the .01 significance level (p=.000), because the hypothesis is based on a negative association between the variables, H19 is rejected.

Under normal circumstances, it is estimated that number of gaps will negatively impact sales. This finding can be explained by the reasons previously stated in the evaluation of correlation between number of gaps and number of SKUs sold. To highlight these once more, while approximately 20000 SKUs are displayed in a hypermarket, and gaps are likely to occur in less frequently sold items. Also the number of gaps may not be high enough to impact sales. Additionally, it is very common that when the customers face out of stock situation, they may convert to another brand or prefer to buy the substitute SKU.

Table 43 Correlation between number of check out points and sales

		Number of check out points	**Sales**
Number of checkout points	Pearson Correlation	1	.821**
	Sig. (2-tailed)		.000
	N	33	33
Sales	Pearson Correlation	.821**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 20: Number of check out points is positively associated with sales.

According to the correlation Table 43, it can be observed that there is a positive relationship between number of check out points and sales (r=.821). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H20 is accepted.

In the light of the correlation analysis results, when number of check-out points increases, sales are expected to increase. Management support the view that more check-out points can positively impact sales, and vice versa, that more sales in the retail stores lead to an increase in the number of check-out points.

5.3.4. Correlation Analysis to Reveal the Relation of Inputs to Output 4

In the fourth group, correlation between six inputs to number of customers (output 4) is conducted seperately. Figure 18 displays the relation of inputs to output 4 and the related hypotheses.

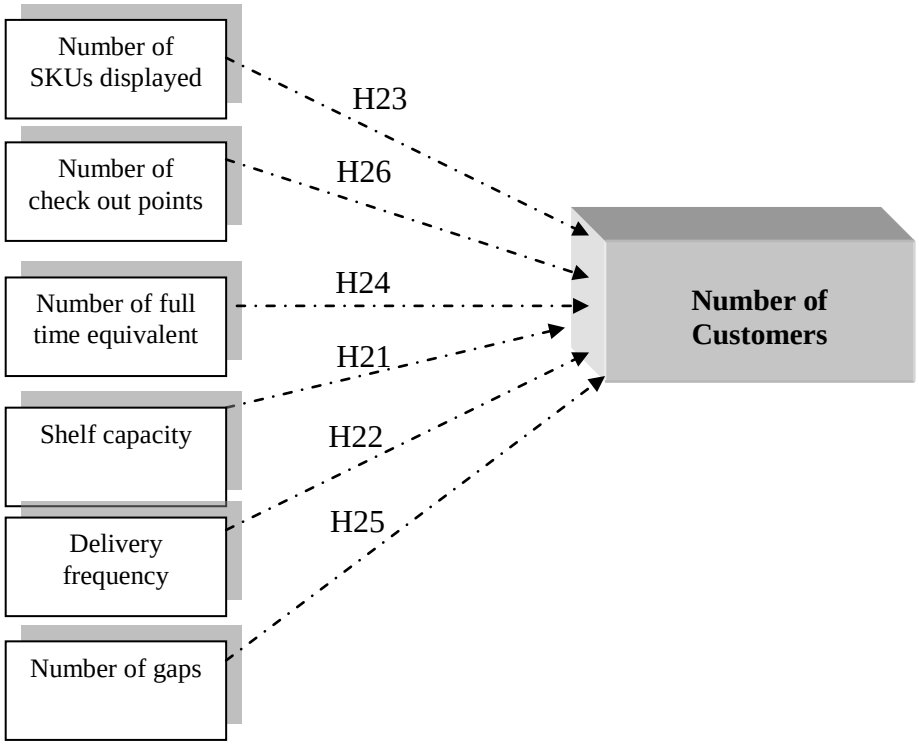

Figure 18 Model of Relation of Inputs to Output 4

Table 44 Correlation shelf capacity and number of customers

		Shelf capacity	Number of customers
Shelf capacity	Pearson Correlation	1	.633**
	Sig. (2-tailed)		.000
	N	33	33
Number of customers	Pearson Correlation	.633**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 21: Shelf capacity is positively associated with number of customers.

According to the correlation Table 44, it can be observed that there is a positive relationship between shelf capacity and number of customers (r=.633). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H21 is accepted.

An increase in shelf capacity is expected to positively the impact number of customers. The management opinion that greater shelf capacity can display more SKUs, positively impacting sales levels.

Table 45 Correlation between delivery frequency and number of customers

		Delivery frequency	Number of customers
Delivery frequency	Pearson Correlation	1	.519**
	Sig. (2-tailed)		.002
	N	33	33
Number of customers	Pearson Correlation	.519**	1
	Sig. (2-tailed)	.002	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 22: Delivery frequency is positively associated with number of customers.

According to the correlation Table 45, it can be observed that there is a positive relationship between delivery frequency and number of customers (r=.519). The correlation is significant at the .01 significance level (p=.002). Regarding these values, H22 is accepted.

In the light of the results, it can be observed that in case of increase in delivery frequency, the number of customers will tend to increase. It is revealed that delivery frequency has a positive association with the number of customers.

Table 46 Correlation between number of SKUs displayed and number of customers

		Number of SKUs displayed	Number of customers
Number of SKUs displayed	Pearson Correlation	1	.487**
	Sig. (2-tailed)		.004
	N	33	33
Number of customers	Pearson Correlation	.487**	1
	Sig. (2-tailed)	.004	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 23: Number of SKUs displayed is positively associated with number of customers.

According to the correlation Table 46, it can be observed that there is a positive relationship between number of SKUs displayed and number of customers (r=.487). The correlation is significant at the .01 significance level (p=.004). Regarding these values, H23 is accepted. It is expected that an increase in the number of SKUs displayed will tend to increase the number of customers.

Table 47 Correlation between number of FTE and number of customers

		Number of FTE	**Number of customers**
Number of FTE	Pearson Correlation	1	.940**
	Sig. (2-tailed)		.000
	N	33	33
Number of customers	Pearson Correlation	.940**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 24: Number of FTE is positively associated with number of customers.

According to the correlation table 47, it can be observed that there is a positive relationship between number of FTE and number of customers (r=.940). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H24 is accepted. When the number of FTE increases, the number of customers is also expected to increase.

Table 48 Correlation between number of gaps and number of customers

		Number of gaps	Number of customers
Number of gaps	Pearson Correlation	1	.711**
	Sig. (2-tailed)		.000
	N	33	33
Number of customers	Pearson Correlation	.711**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 25: Number of gaps is negatively associated with number of customers.

According to the correlation Table 48, it can be observed that there is a positive relationship between number of gaps and the number of customers (r=.711). Although the correlation is significant at the .01 significance level (p=.000), because the hypothesis is based on negative association between the variables, H25 is rejected.

Under normal circumstances, it is estimated that number of gaps will negatively impact number of customers. This is based on the view that, when customers face an out of stock situation, they tend to revisit the retail store less often. Although number of gaps is an important indicator, it is more important to make a deeper analysis in order to reveal the number of gaps through stock keeping unit base. In a hypermarket where approximately 25.000 SKUs are displayed, if the greater number of gaps are in the less frequently sold categories, and if substitute products are available, then the number of gaps is less likely to impact the number of customers.

Table 49 Correlation between number of check out points and number of customers

		Number of check out points	Number of customers
Number of check out points	Pearson Correlation	1	.791**
	Sig. (2-tailed)		.000
	N	33	33
Number of customers	Pearson Correlation	.791**	1
	Sig. (2-tailed)	.000	
	N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 26: Number of check out points is positively associated with number of customers.

According to the correlation Table 49, it can be observed that there is a positive relationship between number of check-out points and number of customers (r=.791). The correlation is significant at the .01 significance level (p=.000). Regarding these values, H26 is accepted. Regarding this finding, number of check-out points has a positive impact on the number of customers. The finding has also found a reasonable level of support from management.

5.4. Reliability of the Research

As explained in previous sections, data used in this study is obtained from the different departments of Retailer A. Cross-check of the accuracy of the data is done with the executives of the related departments. All of the inputs and outputs value are recorded in the retailer's intranet system and updated regularly. The recorded data regarding the variables are transfered to intranet and audited by the executives. While

there is not a scale used to measure the performance of the retail stores, the system characteristics of the retailer ensure that data used in this study is reliable.

In the next chapter, findings in light of research questions, managerial implications, research limitations, future research and conclusion are presented.

CHAPTER 6

DISCUSSION AND CONCLUSION

6.1. Discussion of the Results

Regardless of the industry, performance assessment brings monetary and non-monetary advantages. Hence, it is vital for companies to use proper performance measurement methods and manage the resources and outputs in accordance with performance results. The underlying reason for applying proper performance assessment approaches is due to severe competition in the globalized economy. As discussed in the previous parts of the thesis, supply chain management is considered as an important competition tool. However, applying supply chain management approach is not an easy task, because supply chains are complex and involve numerous members. In order to provide the desired performance level in the supply chain, the role of each chain member is of importance. Therefore, for effective supply chain management, the performance of each chain member should be assessed from supply chain perspective. While each supply chain member can impact the success and performance of the other chain members, solely evaluation of performance results is not sufficient to compete in severe conditions.

Regarding these bases, this study analyzes and examines the performance levels of the retail stores (hypermarkets) belonging to a global retail chain that operates in food retailing. Additionally, it reveals the association of the inputs to outputs used in performance measurement, while also examining the role of selected independent

variables in explaining the variance in selected dependent variables. Research was conducted through the usage of ten variables (six inputs and four outputs). DEA and statistical analyses (multiple regression and correlation) are the main methodology used to collect empirical evidence related to the research questions.

In light of this, in the following sections, the theoretical contribution of the thesis will be discussed through the findings of research questions, while managerial implications, limitations and further research issues will also be reviewed.

6.1.1. Discussion of Findings Regarding Research Questions

As discussed in the introduction, six research questions were determined. The discussion of findings will be based on determined research questions and findings related to each question. Although the number of studies on retail store performance measurement is numerous, evaluating the performance levels of retail stores from supply chain perspective is generally lacking in the literature.

DEA results involved the weekly (52 weeks) performance levels of 33 retail stores. Regarding the size of the data set, analysed weeks and number of retail stores, a total of 1,716 efficiency score results were obtained (52 weeks x 33 retail stores). Efficiency scores for each retail store and each week are provided in the Appendix in the form of figures. However, they are also briefly discussed in the analysis and results section.

DEA also provided input and output weights for each week among each retail store. Regarding this calculation, a total of 17.160 different input and output weights were obtained (52 weeks x 33 retail stores x 10 variables). Although these weights were reported to the management, brief discussion of these results was also considered necessary, therefore standard deviation of inputs weights and outputs weights of all 52 weeks from all retail stores, are presented in the analysis and results part. The other standard deviation figures of inputs and outputs over the weeks and by each DMU (retail store) are presented separately in the Appendicies. Additionally, DEA calculated a decrease in the number of inputs and an increase in the amount in the outputs for each DMU (retail store) in each week that they were inefficient (in order to provide that retail store operates as efficient). Therefore, in order to present this result, the decrease amount (in units) in inputs and increase amount (in units) for DMUs the weeks in which they operate at the lowest efficiency score are displayed in the appendix in the form of tables.

Therefore, evaluating each efficiency score individually is complex, but makes sense from the managerial point of view. Complex relationships can be discussed and examined in full when viewed through a single theoretical point of view (Allison, 1971; Gray and Wood, 1991). Hence, evaluation of results through theories is essential to provide a theoretical grounding.

While this study aimed to provide theoretical grounding for supply chain perspective in retail store performance measurement, related theories that emphasize supply chain perspective were also discussed. Among the related theories, Resource Based Theory (view) is considered as applicable to assess the performance results of the

retail stores. In order to fulfill this aim, research question two was proposed as **"***Can resource based theory be used in assessing retail store performance measurement results?"*.

The analysis conducted in the thesis provided empirical support to answer this research question. According to Barney and Mackey (2005, p.5), *"the best resource based empirical work will involve collecting primary data from firms in a carefully drawn sample"*. Thus, this thesis is used data collected for 33 retail stores, based on ten variables, for 52 weeks.

In the analysis 33 retail stores were examined. While measuring the performance of each store, the same inputs and outputs were used. These inputs were: number of SKUs displayed in store, number of check out points, number of FTE, delivery frequency and number of gaps. Outputs for analysis were selected as: number of customers, number of units sold, number of SKUs sold and sales. All of the retail stores had the same inputs to generate the related outputs. Although literature review was the main approach for determining the inputs and outputs for performance measurement, the managerial point of view also played an important role. In the analysis, all the inputs and outputs were selected bearing in mind that inputs were the main antecedents to generate outputs.

Regarding the research question 2, empirical support was obtained through retail store performance measurement results. The main premise of the resource based view is based on the understanding that close competitors differ according to their resources and capabilities in important and durable ways, thus providing background

for competitive heterogeneity (Helfat and Peteraf, 2003). Resources must be valuable, rare, imperfectly mobile, not easy to copy and not subsitutable (Barratt and Oke, 2007).

In our analysis, inputs can be evaluated as resources for generating the related outputs. When inputs and outputs are evaluated simultaneously, performance of each retail store is obtained. Inputs used in the analysis were: number of SKUs displayed, number of check out points, number of FTE, shelf capacity, delivery frequency and number of gaps. Each input that is analysed can be evaluated as a resource. Therefore, regarding the content of the resource based theory, each resource will be assesed according to their attributes.

From food retailing perspective, the number of SKUs displayed is an important resource. A wide range of product categories enables consumer to find what they are looking for. The resource is assessed as valuable if it improves firm efficiency and/or effectiveness (Rungtusanatham et al., 2003). In the lights of this approach, the number of SKUs displayed is valauble because has been proved that this is an important indicator in providing retail store performance. However, this resource is not rare, because the competitors in food retailing are likely to display the same SKUs. In addition, the retailer can benefit from some SKUs (through special distributorship arrangements) and use them as rare resources. This decision is also based on the corporate strategy, if the retailer considers competitive advantage is provided through displaying special products. Unfortunately, this resource is easily imitable, unless unique products are displayed by the retailer. However, due to globalization and e-commerce applications, each consumer can easily find what they

are looking for from different retailers. Additionally, the number of SKUs sold is not imperfectly mobile while because they are substitutable.

The assessment of the second input from resource based theory, the number of check out points, is proved to be valuable because it has a direct role in increasing the efficiency and effectiveness of the retailer. However, the same inference is not valid for this resource because it is not rare, not imperfectly mobile, is imitable and it is substitutable. The number of check-out points can easily be increased without significant investment.

The third input, the number of FTE, is one of the main determinants in retail store performance. Therefore, this resource is valuable. In Turkey, because accessing human resources is easy it cannot be considered rare . However, it is imperfectly imitable and mobile because the retailer restricts employees by strict agreements. On the other hand, it is substitutable because the competitors can obtain strategically equivalent personnel. Being rare and not substitutable are valid for strategic personnel or top management. In this sense, the retailer should assess its employees as an strategic assets, and evaluate the resource in accordance with corporate strategy.

The case of shelf capacity is similar to number of check-out points. As it has a direct role in improving efficiency and effectiveness, it is proved to be valuable. On the other hand, it is not rare, not imperfectly mobile, easily imitable, not imperfectly mobile and substitutable. For retailers, enhancing shelf capacity is not difficult if the available area already exists in the retail store.

The case of delivery frequency is identical to other inputs to be valuable. Based on logistics and supply chain capability of the retailer, delivery frequency can be rare. For instance, the retailer can make more frequent delivery to the retail store compared to its competitors in the same region. On the other hand, it is imitable, not mobile and substitutable. In order to use delivery frequency as a strategic asset, it should be planned in accordance with suppliers, distribution centre and retail store in order to provide competitive advantage. Otherwise, it is difficult to benefit from this resource if it is planned without taking other activities into consideration.

The last input, the number of gaps has been proved to have a direct impact on determining the retail store performance. Hence, it is valuable. The number of gaps can properly managed through effective coordination and integration with other chain members. According to a report by the Retailer A, number of gaps occur mostly as a result of supply problem. Apart from this, number of gaps may also occur due to the SKU becoming delisted, or supplier delivery problem, positive stock in storeline (SKU is in the backroom, however it is not placed on shelf) and low sales forecast. If the retailer can control its number of gaps more effectively than competitors through proper supply chain and logistics management, this resource is likely to be rare, imperfectly mobile, imitable and it will not be substitutable.

The assessment of outputs from resource based theory can be explained with the capabilities approach. Capabilities refer to skills that are dependent to human competencies and resources refer to all the remaining assets (Markides and Williamson, 1996). Hence, outputs used in analysis, which are number of SKUs sold,

sales, number of customers and number of units occur regarding the skills by the retailer to convert the inputs to desired outputs. Results of retail store performance measurement have revealed that, although inputs and outputs are the same for each retail store, their performance level differs. This is because the management of resources changes according to managerial issues and constraints. It can be therefore inferred that high performance is an indicator of capability.

On the other hand, there are a lack of resources and capabilities to evaluate competitive advantage of Retailer A. The main reason is a lack of knowledge about competitors' performance. In the condition that more information were available on the external environment of the retailers, the role of resources and capabilities can be analyzed in terms of resource based theory.

In brief, this thesis found some empirical support for using resource based theory in the evaluation of retail store performance results. However, as stated in the previous paragraph, more information is needed to provide deeper insight on RBT in retail store performance measurement.

After discussing the findings of research question 2, research question 1 also needs examination. As stated before, research question 1 was determined as *"Can retail store performance be measured by number of Stock Keeping Units (SKU) displayed, number of check out points, number of full time equivalent personnel, shelf capacity, delivery frequency, number of gaps, number of SKUs sold, number of units sold, number of customers and sales?"*. The question included all the variables used in DEA to measure retail store performance measurement. As discussed in previous

sections, all the variables (either inputs or outputs) had input and output weights (regarding the DEA), hence it is proved that the above stated variables can be used to measure the performance of retail stores.

The third research question was formulated as *"To what extent are inputs used in retail store performance assessment related to outputs?"*. In order to find the answer to this question, 24 correlation analysis were conducted (6 inputs x 4 outputs). It was found that most of inputs are highly related to outputs, revealing that selected inputs for the analysis were in accordance with the selected outputs and therefore provide managerial insight.

Based on the managerial guidance, two different multiple regression analyses were conducted. In the light of these, research question four and five were formulated. It was found that the number of SKUs sold can be predicted by only two variables, shelf capacity and number of FTE. On the other hand, sales can be predicted only number of units sold. The explained variance regarding two multiple regression analyses were discussed in the analysis chapter.

The last research question was formulated as to whether if weekly analysis provides comprehensive managerial and theoretical insights. Regarding this research question, theoretical insight is obtained through the usage of resource based theory. Usage of resource based theory to assess retail store performance measurement would be limited if the study was conducted with a single data set (annual or monthly data). With a weekly analysis of 52 weeks, we observed the changes of performance levels

for each retail store. Therefore, weekly analysis is more effective from a managerial point of view.

From theoretical insights, we used resource based theory to assess the retail store performance analysis results. In addition, with the empirical evidence obtained through analysis, we found support for the theory of constraints (TOC) in retail store performance. Regarding TOC, the constraint based approach recognizes the importance of identifying the constraint(s) that inhibit chain members from satisfying a necessary condition, or achieving overall profitability (Simatupang et al., 2004). In the light of the constraint based approach, while each individual retail store performance is different, the constraint(s) that hinder the retail store from operating efficienctly should be determined. A more specific outlook, the number of gaps occuring at each store, can also be explained through a constraint based approach. While the suppliers and central system are the same for each retail store, the number of gaps varies according to individaul stores. This is due to the fact that each retail store has to deal with different constraints in managing the number of gaps. Regarding this inference, although resources are the same for generating the desired outputs, the role of employees is not neglegible.

Briefly, regarding the six research questions, the answer for each research question was found. It is concluded that the performance of retail stores is dependent on its chain members for generating the related outputs. The retailer needs the necessary amount of different SKUs to be displayed, regarding SKUs it needs sufficient shelf capacity and delivery frequency has to be in accordance with the retail store's needs, and finally the number of gaps should be properly managed through the coordination

and integration with chain members. In essence, each chain member is responsible for generating the desired outputs (sales, number of customers, number of units sold and number of SKUs sold). The responsibility of each chain member is to provide the inputs required by the retailer. If these are not provided in the desired form, outputs will directly impacted (proved by the relation of inputs to outputs).

After discussing the findings based on research questions, the next part will review the managerial implications of this thesis.

6.2. Managerial Implications

Retailer A previously used only sales data to assess the performance of its retail stores only using a sales indicator. They even did not apply a store by store performance measurement. None of the departments evaluated the performance of retail stores holistically. After this study, the retailer A will be able to assess the performance of its retail stores holistically. After reviewing the findings of this research with the management, it is also revelaed that holistic performance measurement (performance measurement with more than one variable) provides greater managerial insight, thus Retailer A can now examine what needs to be done to enable stores operate efficiently. Brief findings regarding possibilities for increasing outputs and decreasing inputs is provided in Appendix 4. In addition, they can now see the influence of each input or output on retail store performance measurement. This is provided with DEA analysis. The findings using statistical analysis also provided insight, enabling the prediction of sales and number of SKUs sold with the determined independent variables (for sales-number of units sold, for

number of SKUs sold- shelf capacity and number of FTE). Furthermore, correlation analysis has supported the interaction between inputs and outputs. The management can now make assessments based on the correlation analysis. For retail stores which are not operating efficiently, they may consider a deeper analysis to enable them to operate more efficienctly.

This new performance measurement model (which is described in the introduction) can be used in assessing the performance of all retail stores. Excellence in logistics and supply chain management in food retailing is essential for the achievement of greater efficiency; therefore a holistic view is vital in determining the inputs and outputs for performance measurement. The management was also aware of the fact that traditional productivity analysis does not provide detailed information about the ongoing processes and problematic components. Therefore they also made a contribution to determining the inputs and outputs used in this research.

6.3. Research Limitations and Future Research

There are a number of limitations of this study. Firstly, the variables selected for performance measurement of retail store were selected in the light of a literature review and also managerial suggestions in order to present the supply chain perspective. The data set was collected from the retailer to measure the performance of the retail stores. However, in order to analyse the role of chain members more comprehensively, the data should be collected also from other chain members, and performance measurement analysis should be conducted for the other chain members as well.

Most of the variables used in this study reflected the supply chain perspective, while their levels depend on the performance of the other chain members (e.g. delivery frequency, number of gaps, number of SKUs displayed, sales, number of units sold). This can be a limitation which hinders assessment from other points of view (e.g. performance measurement according to human resources, cost and flexibility). Therefore, this performance measurement model displays insight for supply chain perspective, but not the other approaches. This research focused on only food retailing. In order to generalize the findings, research on different types of retailers should be performed. Also, the retailer selected in this study was based on the willingness of the retailer to engage in University-Industry collaboration. The performance measurement results can significantly differ for another retailer operating in the same format.

Future research can be conducted on a comparison of retailers in the same category. Also, retailer A is a global retailer, with long term experience not only in the Turkish market but also in international markets. By taking into consideration this issue, the same model can be applied to a retailer that operates domestically, and comparison of results will provide both theoretical and managerial insight.

Additionally, this analysis was conducted with 52 weeks data, it may be performed with two year data, and a comparison of years can provide more meaningful explanations. As future research, performance measurement with cost and external environment data can provide better external analysis for evaluating the competitive advantage of the retailer.

In Turkey, research held with real company data is limited. This situation is valid not only in the retailing industry, but also in other industries. Although research with real company data is appreciated, for further research questionnaires prepared to reveal managers' perception of performance measurement could also provide interesting results. In this kind of research, comparison of real performance and perceived performance can be compared. On the other hand, understanding of supply chain perspective by the managers can provide greater grounding for the supply chain perspective. In this respect, survey method can be used. This type of research can reveal the understanding of supply chain perspective by the retailers.

Additionally, future research can be conducted if retail promotions impact retail store performance. The impact of retail promotions can be assessed both from retailer's and consumers' point of view. It is also possible that retailers can take precautive actions during retail promotions. This can be explored by using survey or in-depth interviews held with the executives.

One more area of extension area is the application of this performance measurement model to the Turkish retailing industry. In Turkey, industry level performance measurement is accomplished by Trade Council of Shopping Centers & Retailers through retail index; however a more comprehensive index measurement is necessary for the retail industry, with an orientation to other variables. Presenting the results of this study to Trade Council of Shopping Centers & Retailers and recommending the use of a different index model is an aim to be accomplished as future research.

6.4. Conclusion

In the literature it is stated that, in general, ways to make a significant contribution are based on either adding new knowledge, deepening the understanding of existing knowledge or addressing problems of interest to practitioners. In this sense, this thesis aimed add new knowledge on retail store performance measurement, focused on deepening the understanding on existing knowledge in retailing, and helped the practititoners by suggesting a new framework to measure retail store performance.

While retailing industry is still in its growth stage in Turkey, it is hoped that more research on retailing will provide a deeper understanding on retail dynamics. Additionally, this thesis has made contribution to both the supply chain and retailing literature by taking an interdisciplinary approach. It is hoped that more academic work in this field will provide a deeper understanding, both to academicians and practitioners.

APPENDIX 1

GAMS Model

```
SETS
j       DMU_index      /1*33/
r       Output_index   /1*4/
i       Input_index    /1*6/
t       Period_index   /1*52/
alias (j,k)
;$CALL GDXXRW.EXE veriler\birlesikdata.xlsx par=y  rng=output!A1:XFD35
Rdim=1 Cdim=2 *=== Now import data from GDX
Parameter y(j,r,t);$GDXIN birlesikdata.gdx $LOAD y $GDXIN
$CALL GDXXRW.EXE veriler\birlesikdata.xlsx par=x  rng=input!A1:XFD35
Rdim=1 Cdim=2 *=== Now import data from GDX Parameter x(j,i,t);
$GDXIN birlesikdata.gdx $LOAD x $GDXIN;
parameter
vlo vlower
ulo ulower
NORM normalizing const;
vlo=1e-6;
ulo=1e-6;
NORM=1000;
VARIABLES
Totaleff
dTotaleff
mu(j,t);
```

POSITIVE VARIABLES

Xsum(j,i)

Ysum(j,r)

u(r,j,t) input weights

v(i,j,t) output weights

eff(j,t) dmu efficiency in period t

deff(j,t) dual dmu efficiency in period t

z(j,t) aciklama

lam(j,k,t) dual weights

vs (i,j,t) input duals

us (r,j,t) output duals

EQUATIONS

pobj Objective Function

p1 (j,t) total input value is set to a constant

p2 (r,j,t) output u epsilon

p3 (i,j,t) input v epsilon

p4 (j,t) eff

p5 (j,k,t) compare

d1

d2

d3

d4

dobj

acX

```
acY

boundz;

pobj.. TotalEff=E=SUM((j,t),eff(j,t));

p1 (j,t)  .. sum(i,v(i,j,t)*x(j,i,t))=e=NORM;

p4 (j,t)   .. sum(r,u(r,j,t)*y(j,r,t))-mu(j,t)-eff(j,t)=e=0;

p5 (j,k,t)  .. sum(r,u(r,j,t)*y(k,r,t))-mu(j,t)-sum(i,v(i,j,t)*x(k,i,t))=L=0;

p2 (r,j,t).. u(r,j,t)=G=ulo;

p3 (i,j,t).. v(i,j,t)=G=vlo;

d1(i,j,t) .. sum(k, lam(j,k,t)*x(k,i,t))  + vs(i,j,t) =E= z(j,t)*x(j,i,t);

d2(r,j,t) .. sum(k, lam(j,k,t)*y(k,r,t))  - us(r,j,t) =E= y(j,r,t);

d3 (j,t)  .. sum(k,lam(j,k,t))=E=1;

d4(j,t)   .. deff(j,t)=E= norm*z(j,t)-vlo*sum (i, vs(i,j,t))-ulo*sum(r,us(r,j,t));

dobj      .. dTotalEff=E= sum ((j,t), deff(j,t));

BOUNDZ (J,T) .. z(j,t)=L=11;

acX(j,i) .. sum(t,x(j,i,t))=E=xsum(j,i);

acY(j,r) .. sum(t,y(j,r,t))=E=ysum(j,r);

MODEL DEA/p1, p2, p3,p4,p5, pobj,acX,acY/;

MODEL dDEA/d1, d2, d3,d4, dobj,boundz/;

DEA.iterlim=100000;

DDEA.iterlim=100000;

option lp=cplex;

SOLVE DEA USING lp maximizing TotalEff;

SOLVE dDEA USING lp minimizing dTotalEff; display eff.l;

display deff.l;

*parameter Xreport (j,t,i);
```

```
*Xreport(j,t,i)=x(i,j,t);

*parameter Yreport(j,t,r);

*Yreport(j,t,r)=y(r,j,t);

display y;

*compute and display Y targets using primal model

*parameter pYtarget(r,j,t); pYtarget(r,j,t)=norm*y(r,j,t)/eff.L(j,t);

*display pYtarget;

*compute and display X and Y targets using dual model

parameter dYtarget(r,j,t); dYtarget(r,j,t)=sum(k,lam.L(j,k,t)*y(k,r,t));

parameter dXtarget(i,j,t); dXtarget(i,j,t)=sum(k,lam.L(j,k,t)*x(k,i,t));

display dYtarget;

display dXtarget;

*compute and display suggested Y increases and X decreases

parameter dYincrease(r,j,t);

dYincrease(r,j,t)=sum(k,lam.L(j,k,t)*y(k,r,t))-y(j,r,t);

parameter dXdecrease(i,j,t);

dXdecrease(i,j,t)=x(j,i,t)-sum(k,lam.L(j,k,t)*x(k,i,t));

display dYincrease ;

display dXdecrease;

*=== Export to Excel using GDX utilities

*=== First unload to GDX file (occurs during execution phase)

*execute_unload "DEA_VRS.gdx"  xreport , yreport, u.L, v.L, eff.L, dYincrease,

dXdecrease; execute_unload "DEA_VRS.gdx"   deff.l, lam.l, x, xsum.L, ysum.L,

u.L, v.L, eff.L, dYincrease, dXdecrease, dYtarget,dXtarget;

*=== Now write to variable levels to Excel file from GDX
```

*=== Since we do not specify a sheet, data is placed in first sheet

execute 'gdxxrw.exe DEA_VRS.gdx o=veriler\DEA_VRS.xls var=lam.L rng=lam!a1 rdim=2 cdim=1 par=x RNG=X!A1 rdim=2 cdim=1 var=xsum.L rng=xsum!a1 var=ysum.L rng=ysum!a1 var=u.L Rdim=2 Cdim=1 rng=u!a1 var=v.L Rdim=2 Cdim=1 rng=v!a1 var=eff.L rng=eff!a1 var=deff.L rng=deff!a1 par=dYincrease Rdim=2 Cdim=1 rng=yincrease!a1 par=dXdecrease Rdim=2 Cdim=1 rng=xdecrease!a1 par=dYtarget Rdim=2 Cdim=1 rng=Ytarget!a1 par=dXtarget Rdim=2 Cdim=1 rng=xtarget!a1'

APPENDIX 2

WEEKLY EFFICIENCY RESULTS

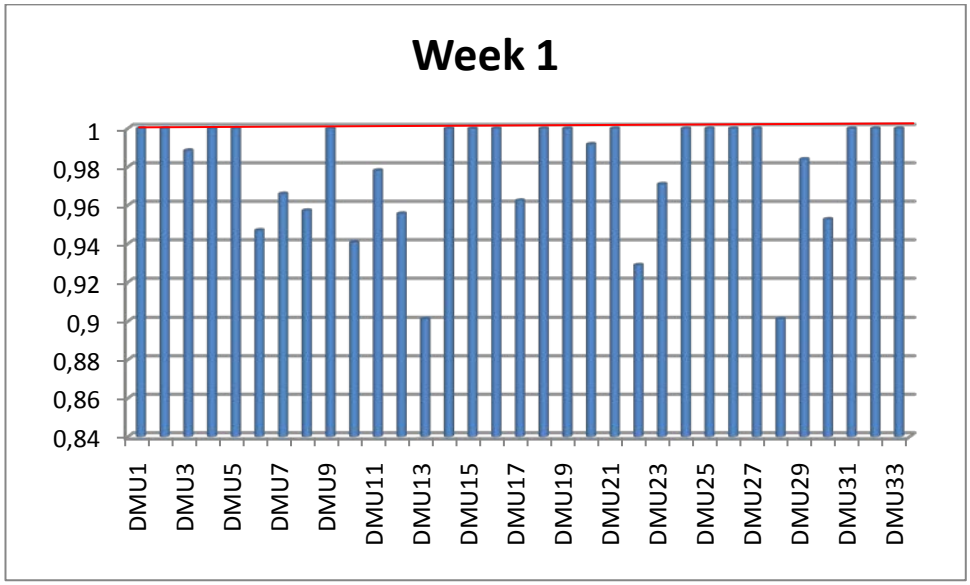

Figure 19 Efficiency Scores of DMUs in Week 1

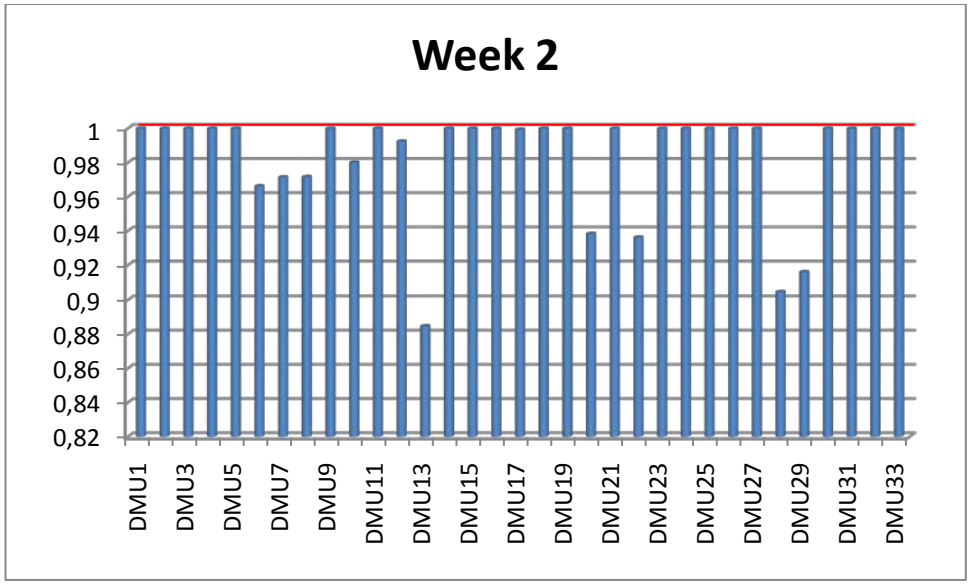

Figure 20 Efficiency Scores of DMUs in Week 2

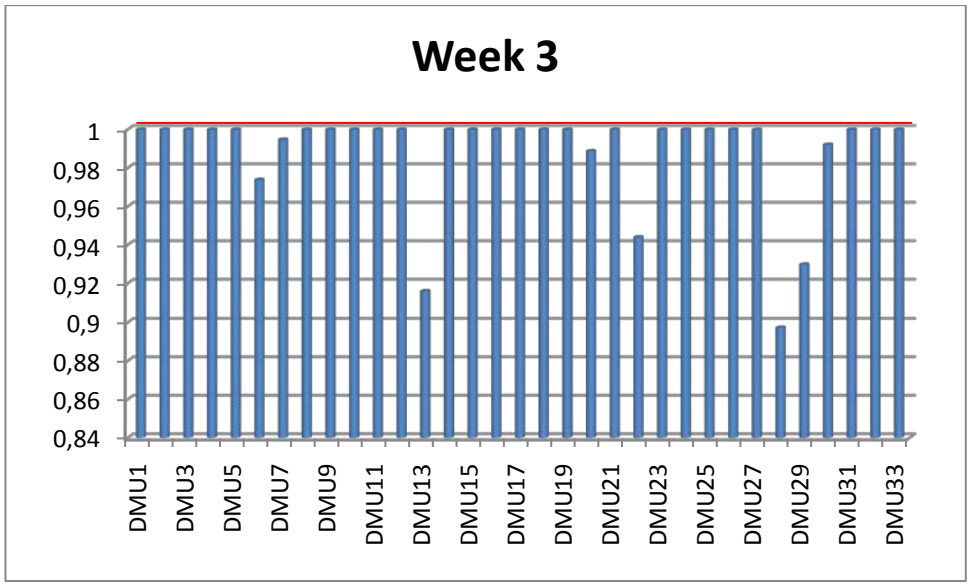

Figure 21 Efficiency Scores of DMUs in Week 3

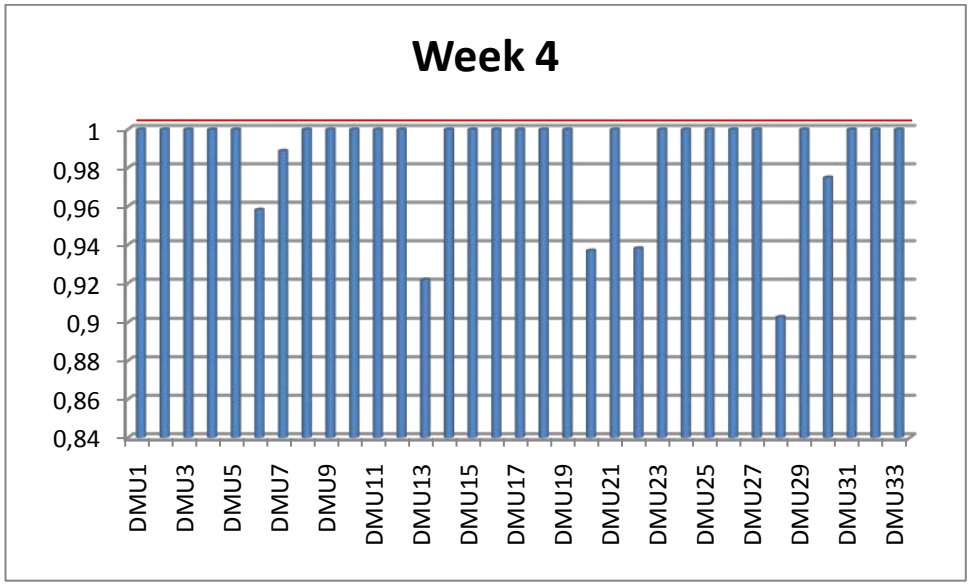

Figure 22 Efficiency Scores of DMUs in Week 4

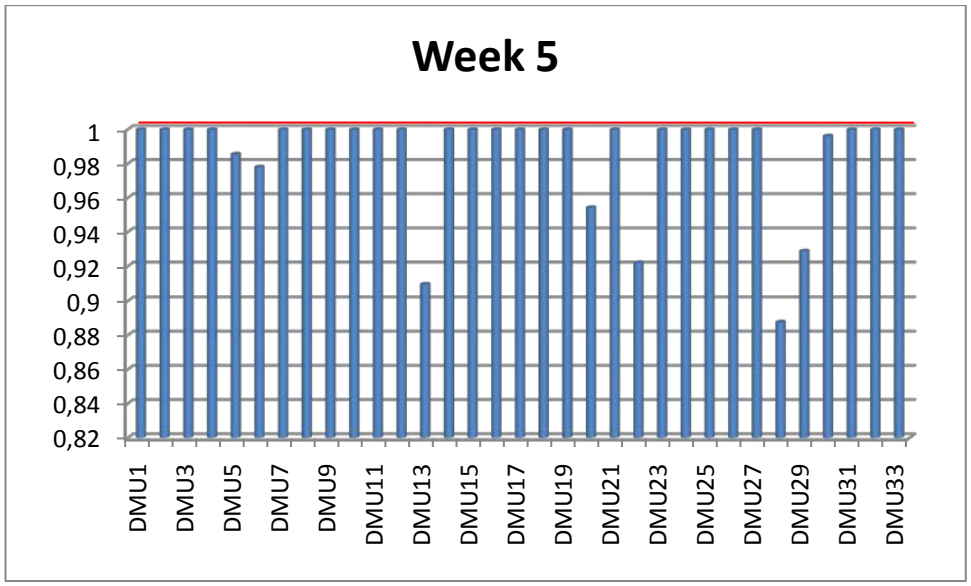

Figure 23 Efficiency Scores of DMUs in Week 5

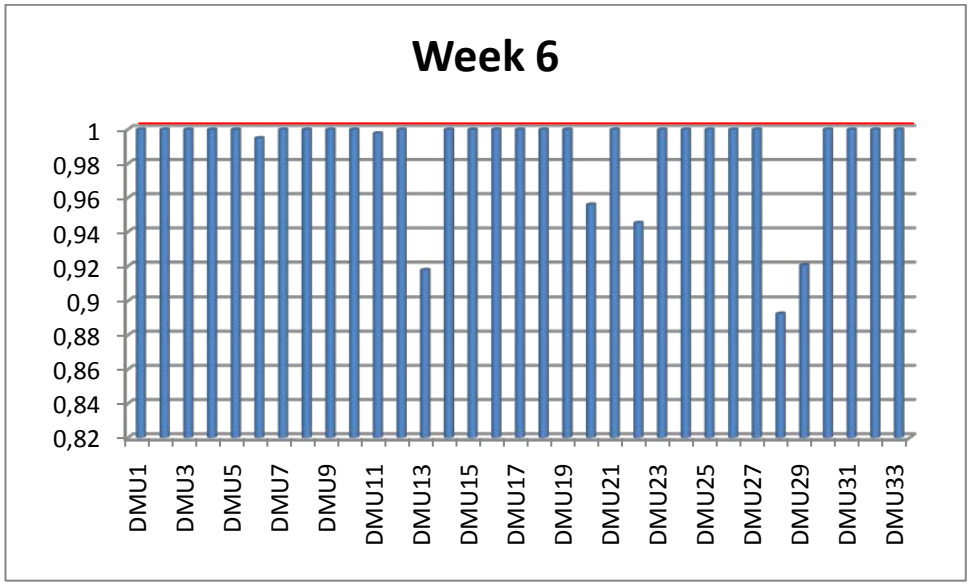

Figure 24 Efficiency Scores of DMUs in Week 6

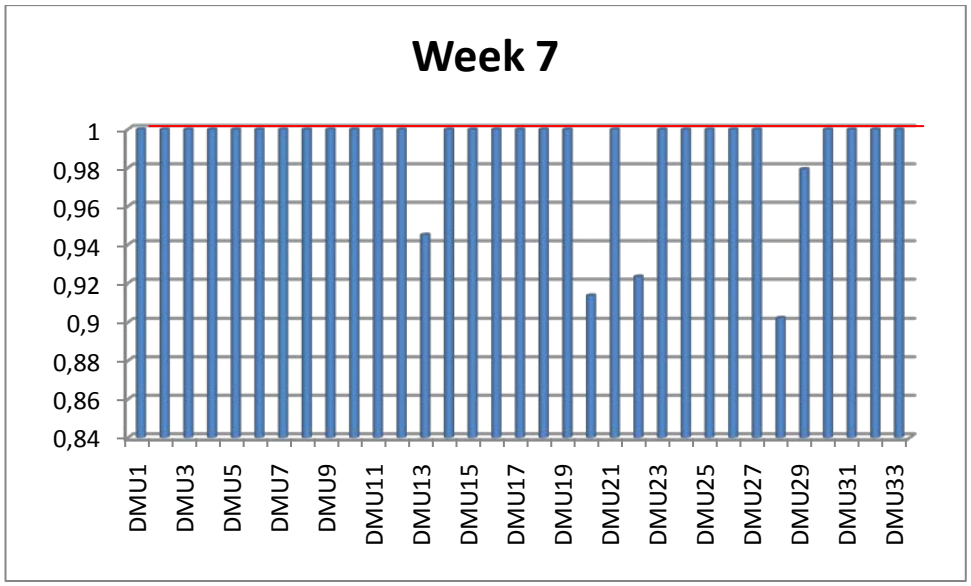

Figure 25 Efficiency Scores of DMUs in Week 7

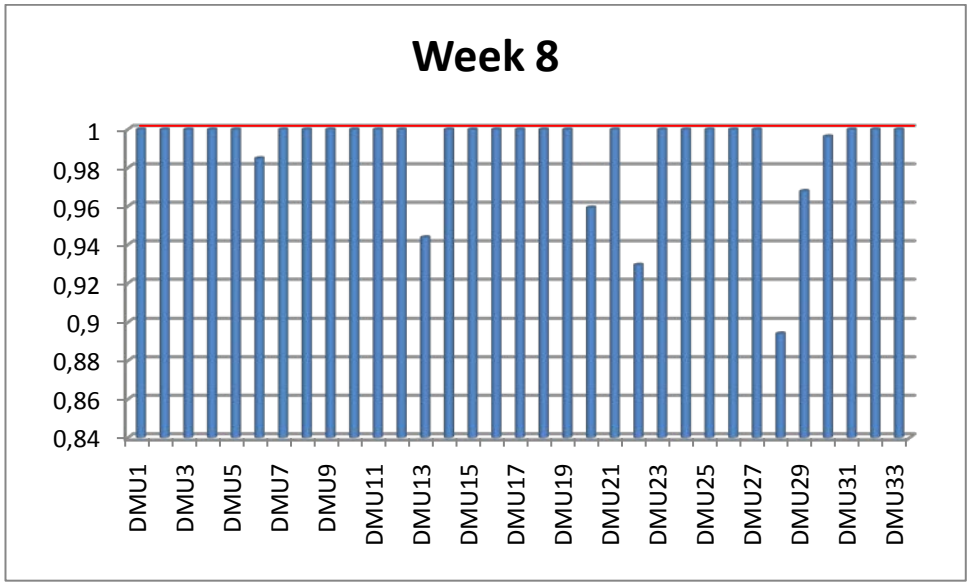

Figure 26 Efficiency Scores of DMUs in Week 8

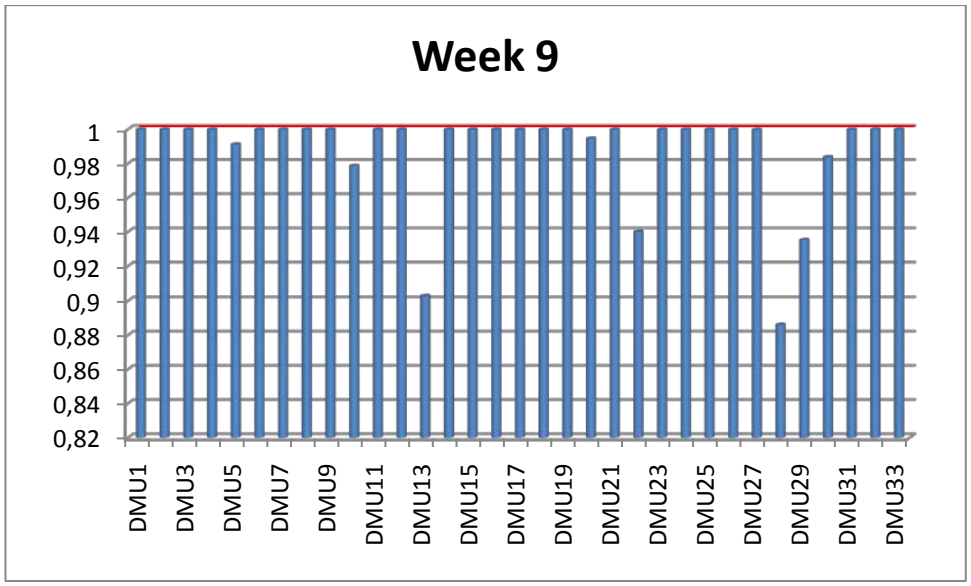

Figure 27 Efficiency Scores of DMUs in Week 9

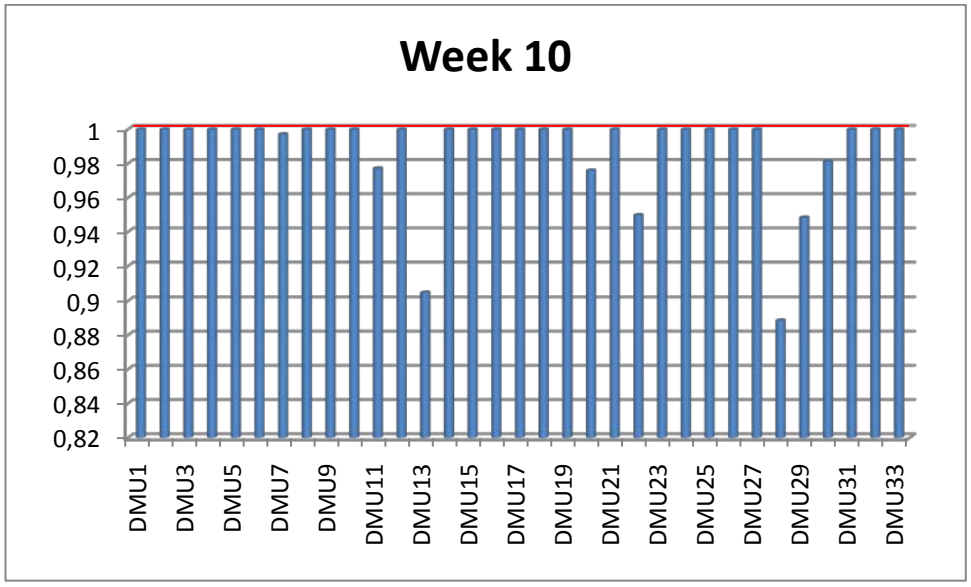

Figure 28 Efficiency Scores of DMUs in Week 10

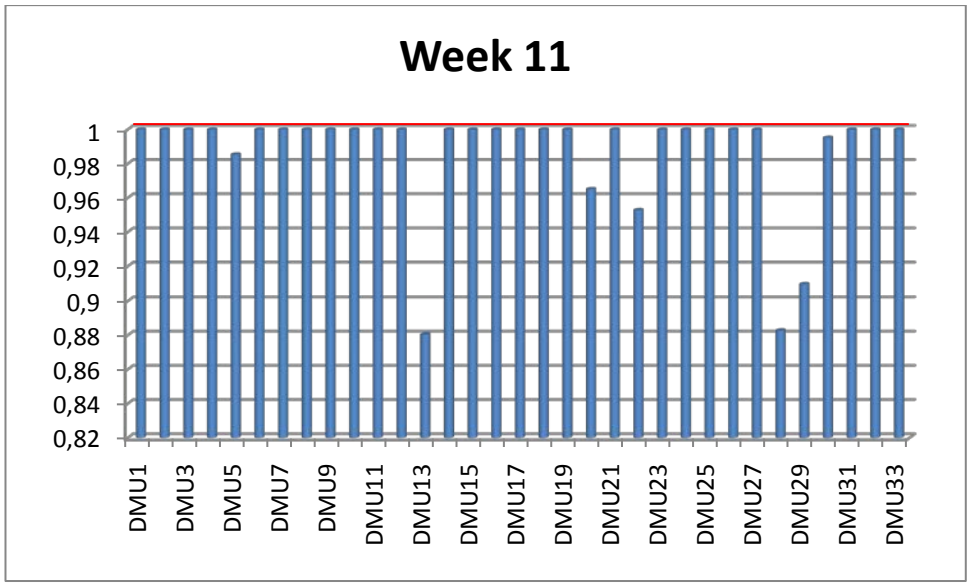

Figure 29 Efficiency Scores of DMUs in Week 11

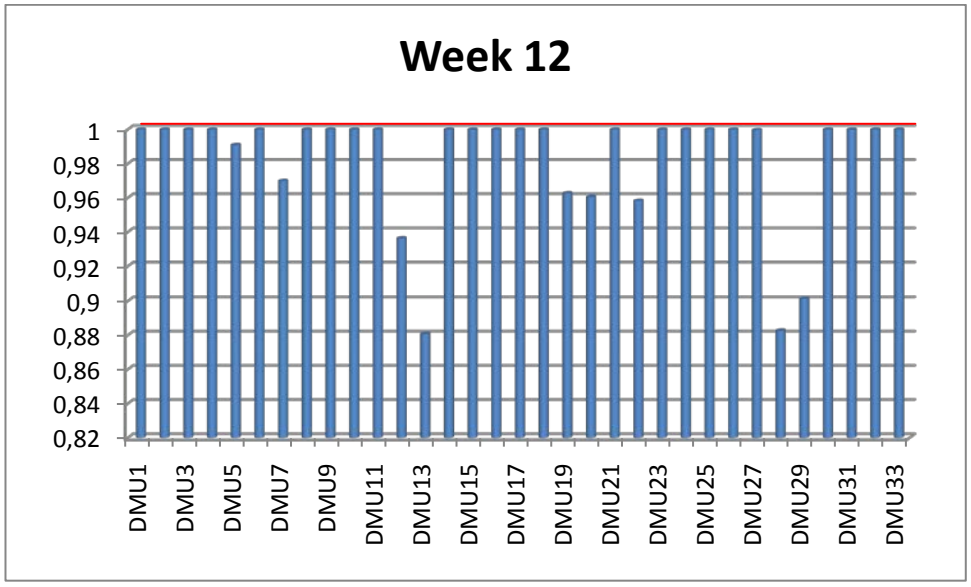

Figure 30 Efficiency Scores of DMUs in Week 12

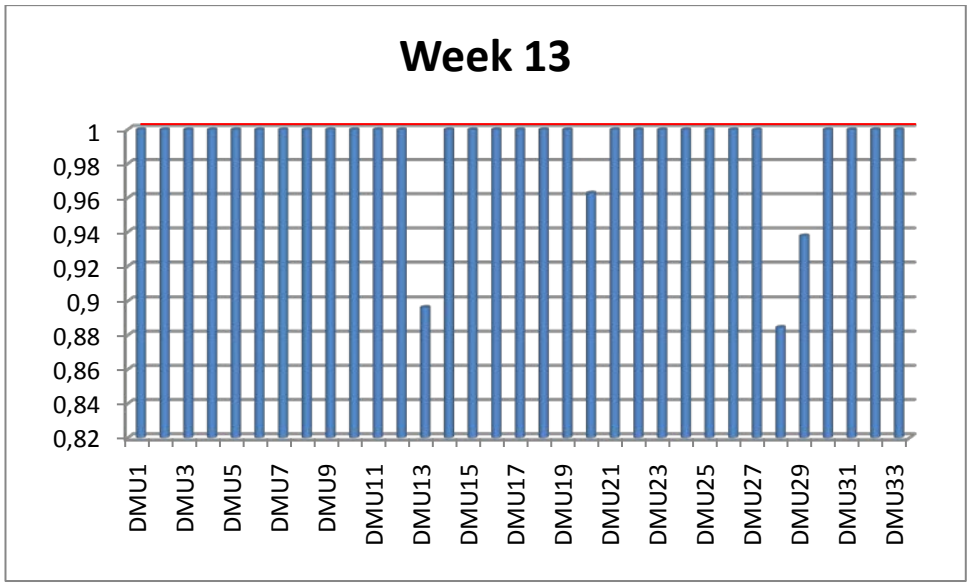

Figure 31 Efficiency Scores of DMUs in Week 13

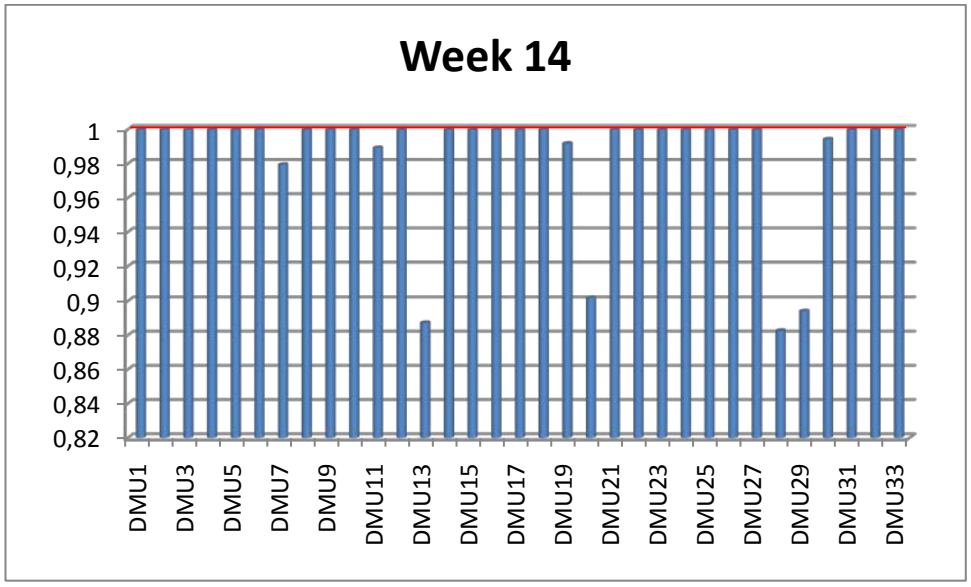

Figure 32 Efficiency Scores of DMUs in Week 14

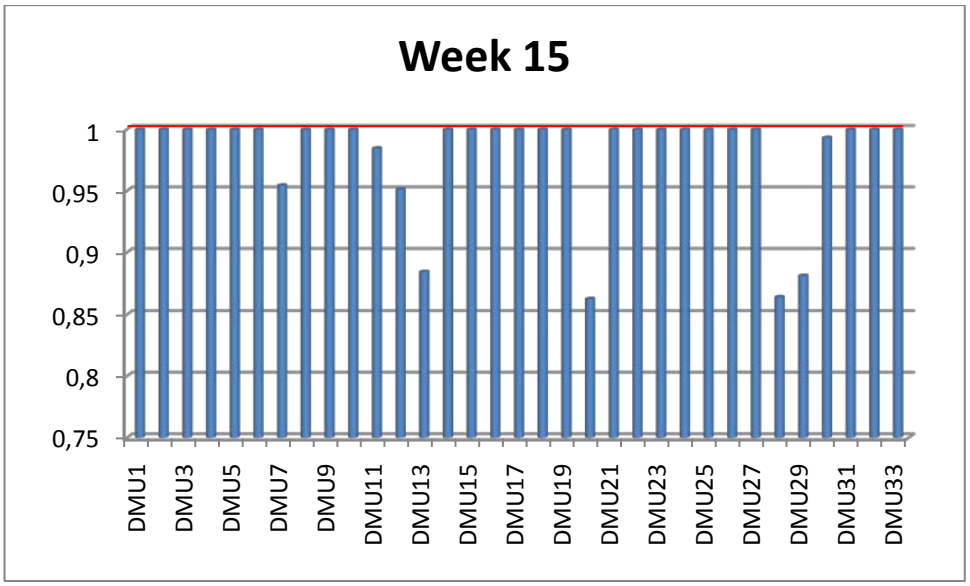

Figure 33 Efficiency Scores of DMUs in Week 15

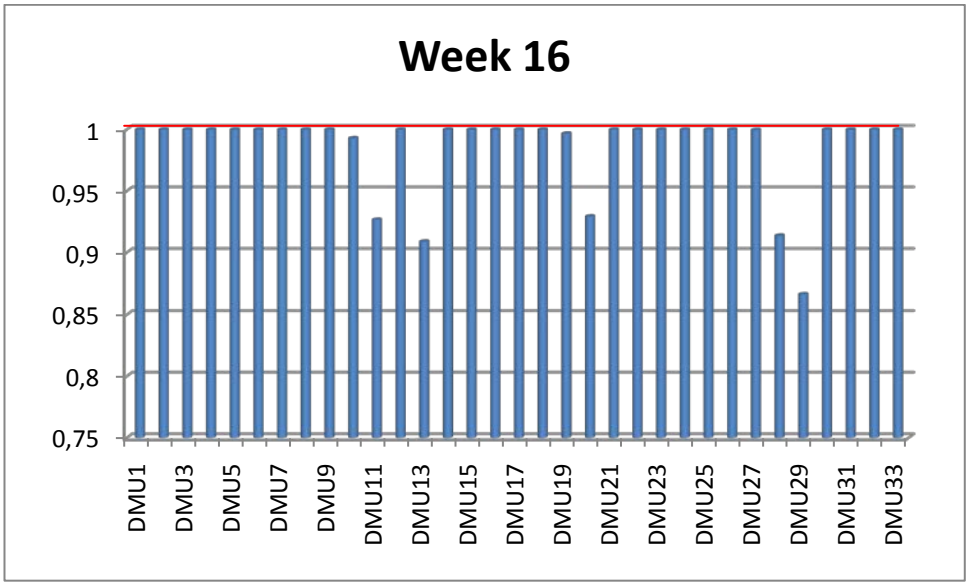

Figure 34 Efficiency Scores of DMUs in Week 16

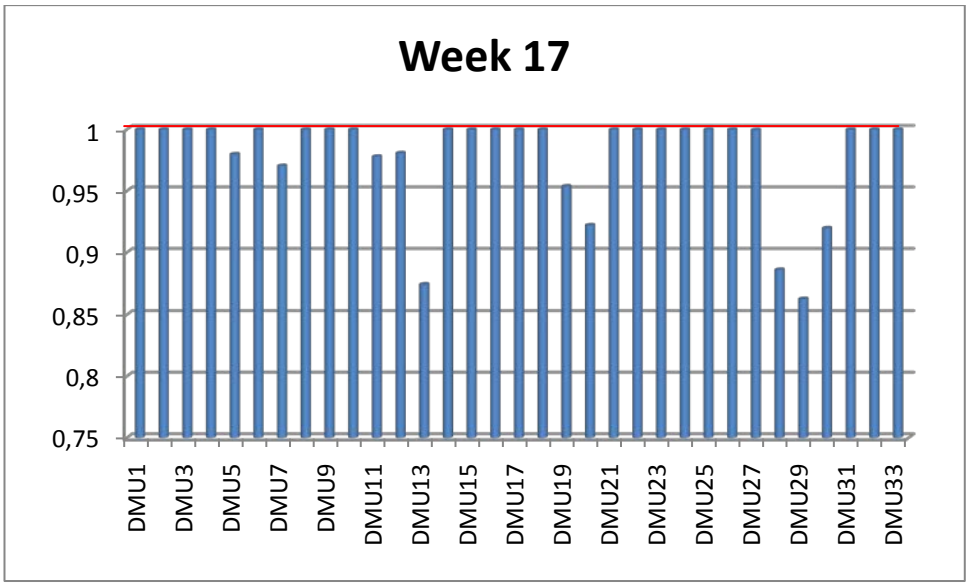

Figure 35 Efficiency Scores of DMUs in Week 17

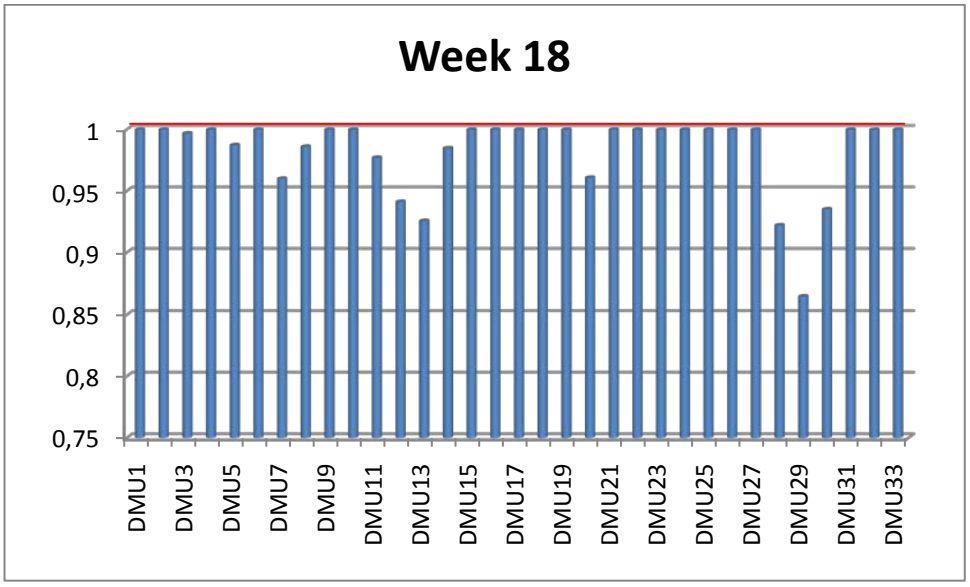

Figure 36 Efficiency Scores of DMUs in Week 18

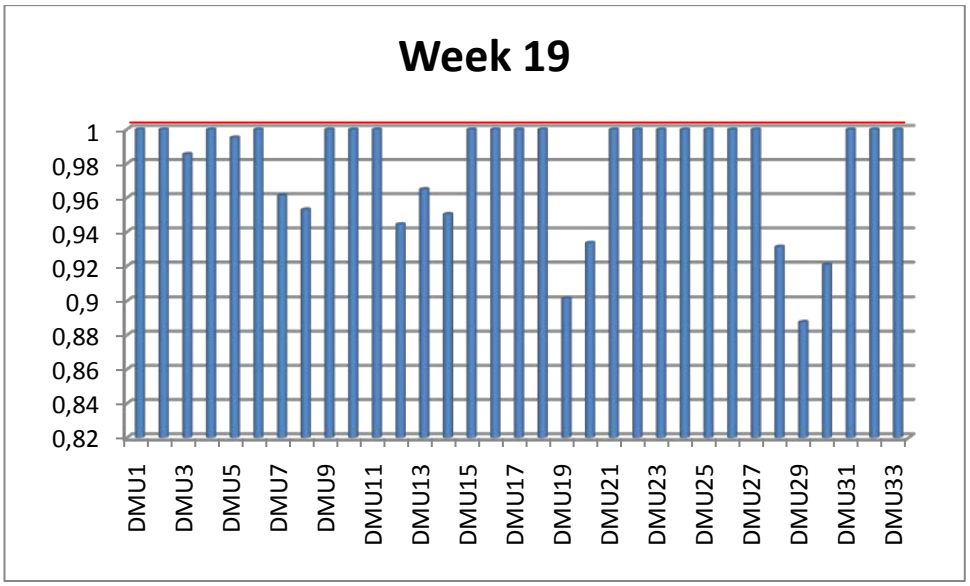

Figure 37 Efficiency Scores of DMUs in Week 19

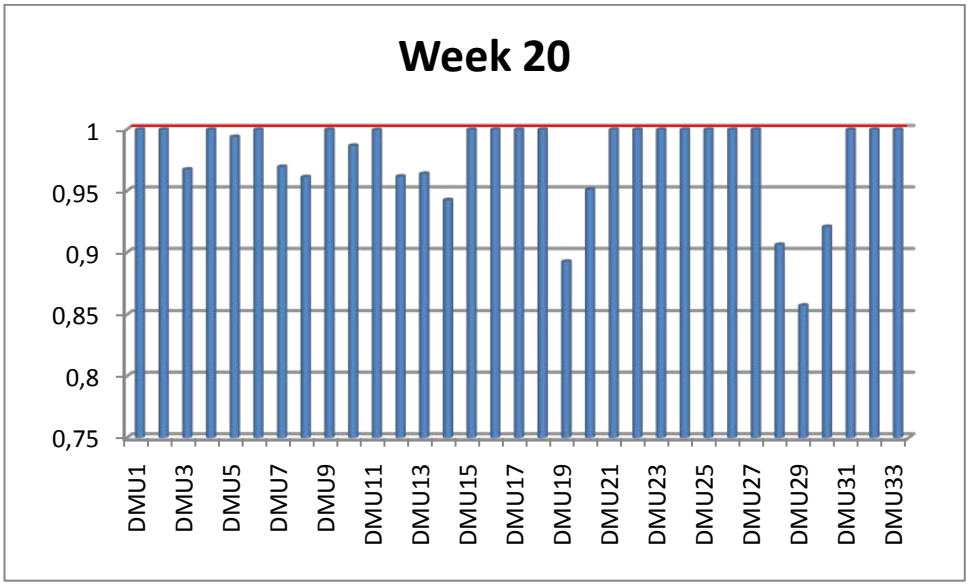

Figure 38 Efficiency Scores of DMUs in Week 20

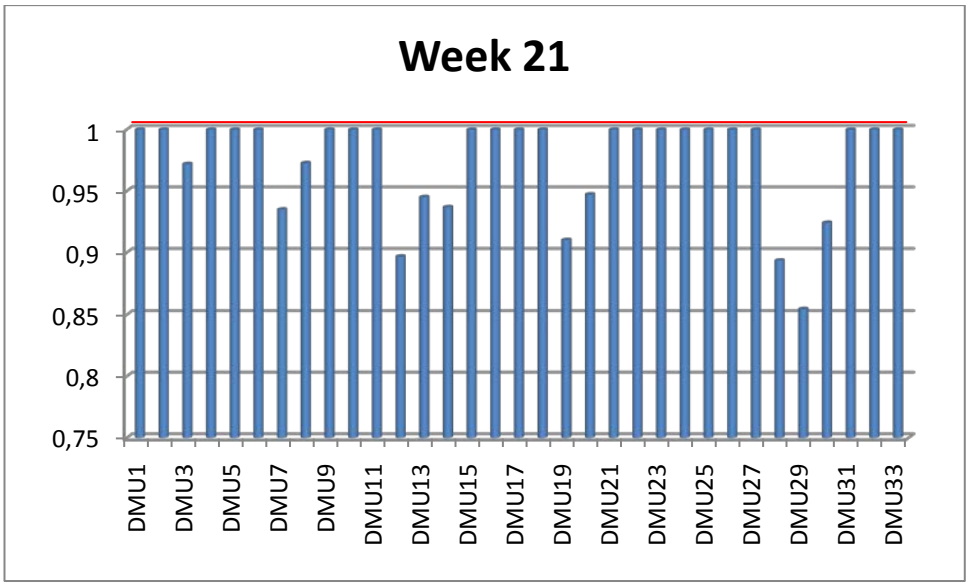

Figure 39 Efficiency Scores of DMUs in Week 21

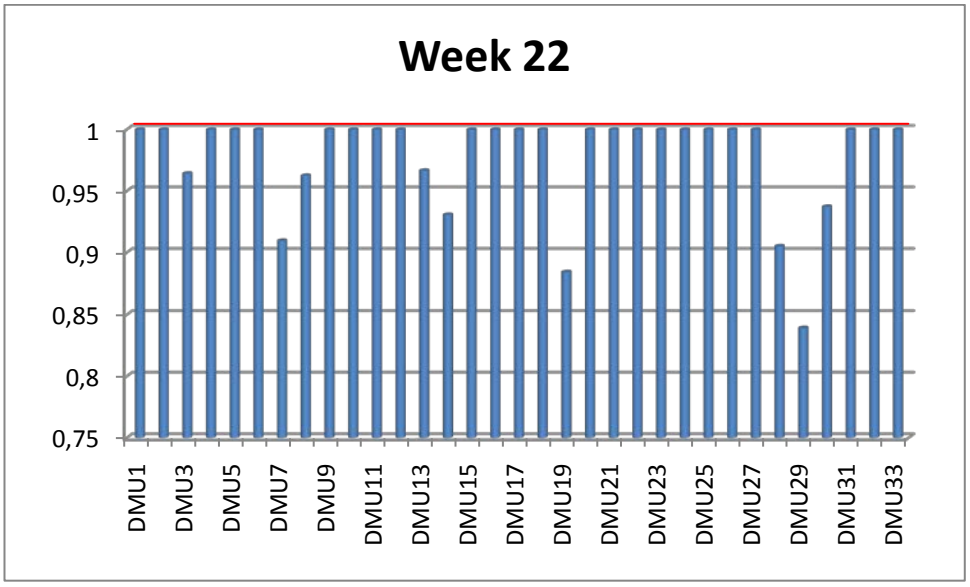

Figure 40 Efficiency Scores of DMUs in Week 22

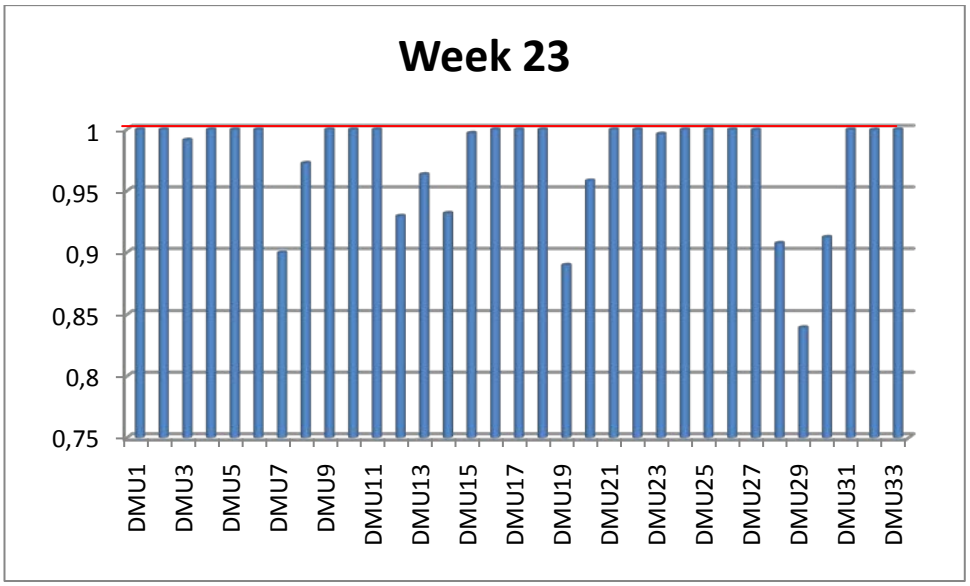

Figure 41 Efficiency Scores of DMUs in Week 23

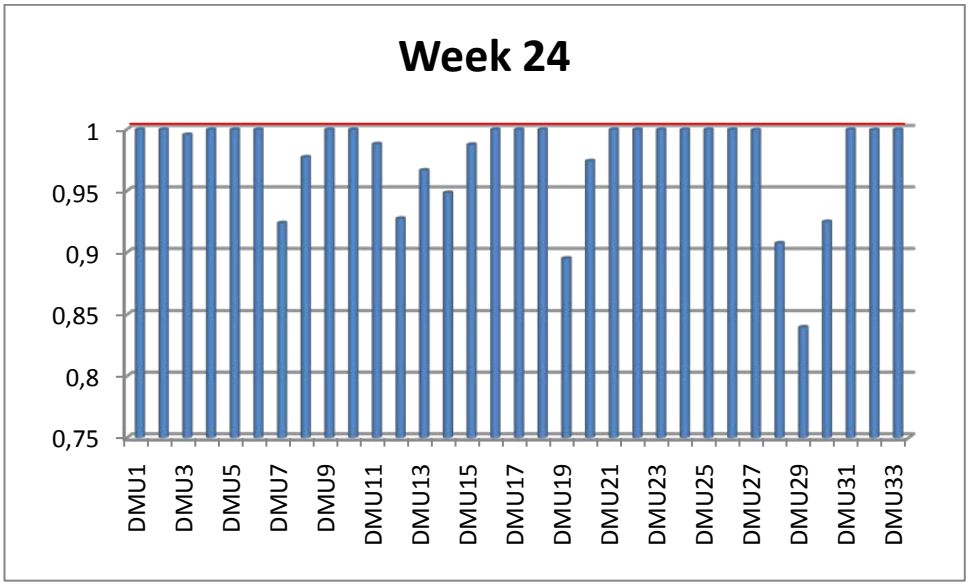

Figure 42 Efficiency Scores of DMUs in Week 24

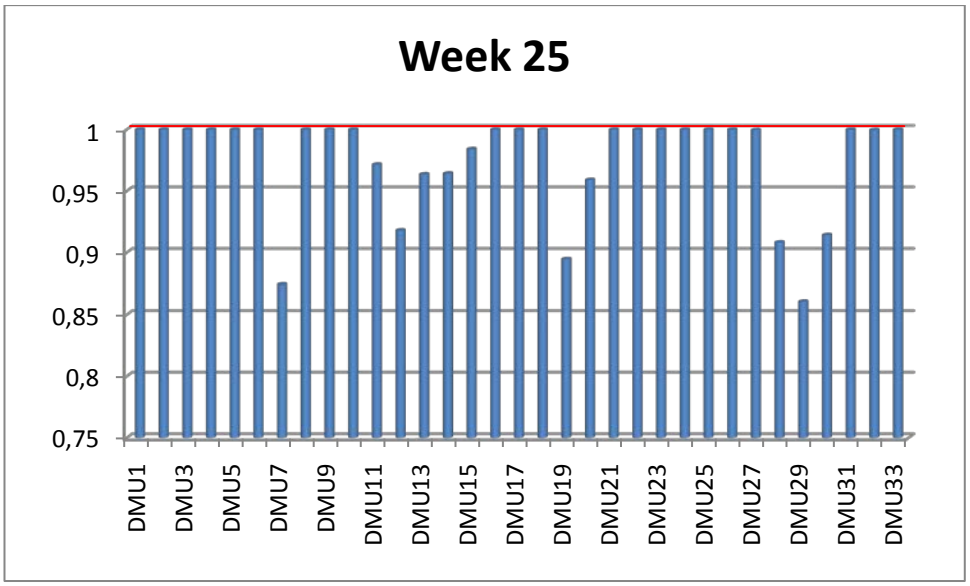

Figure 43 Efficiency Scores of DMUs in Week 25

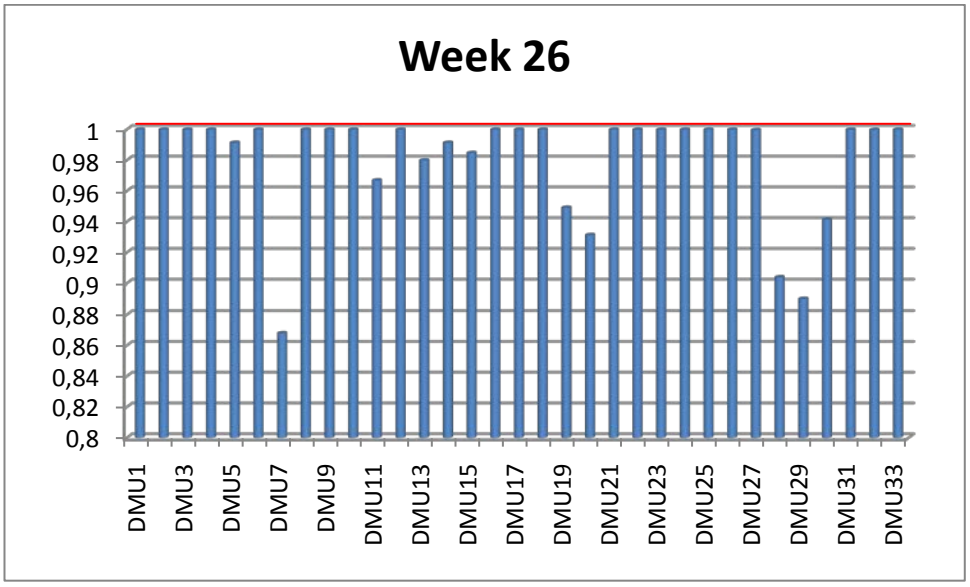

Figure 44 Efficiency Scores of DMUs in Week 26

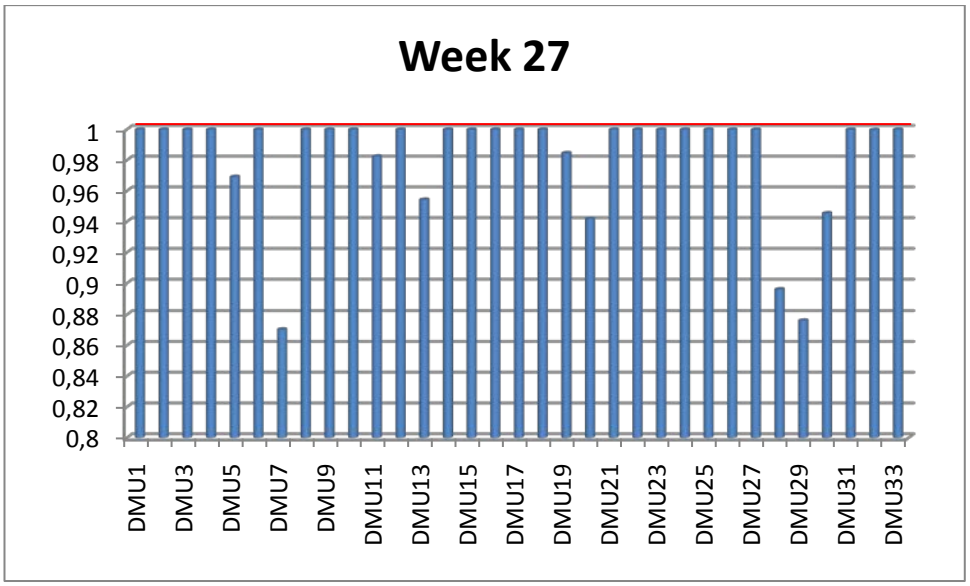

Figure 45 Efficiency Scores of DMUs in Week 27

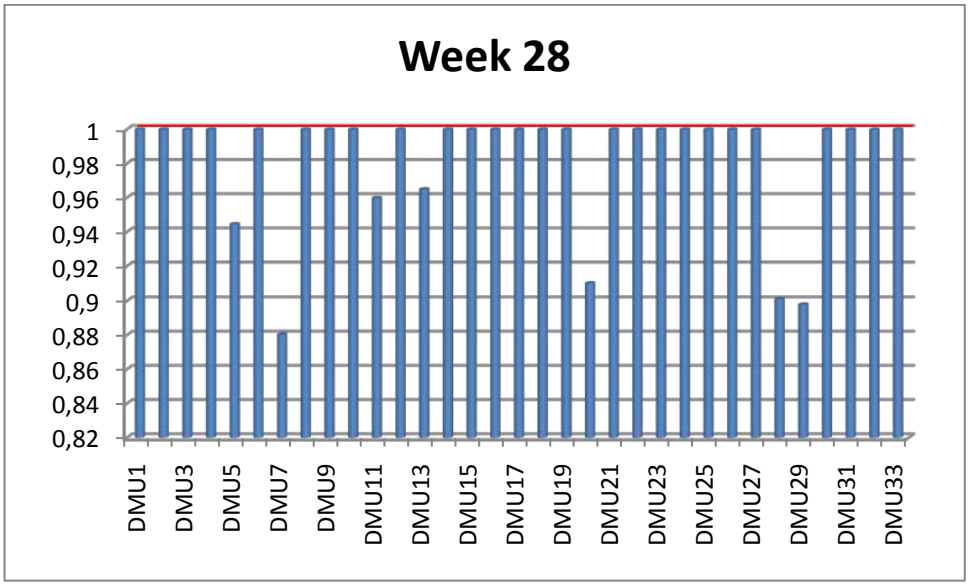

Figure 46 Efficiency Scores of DMUs in Week 28

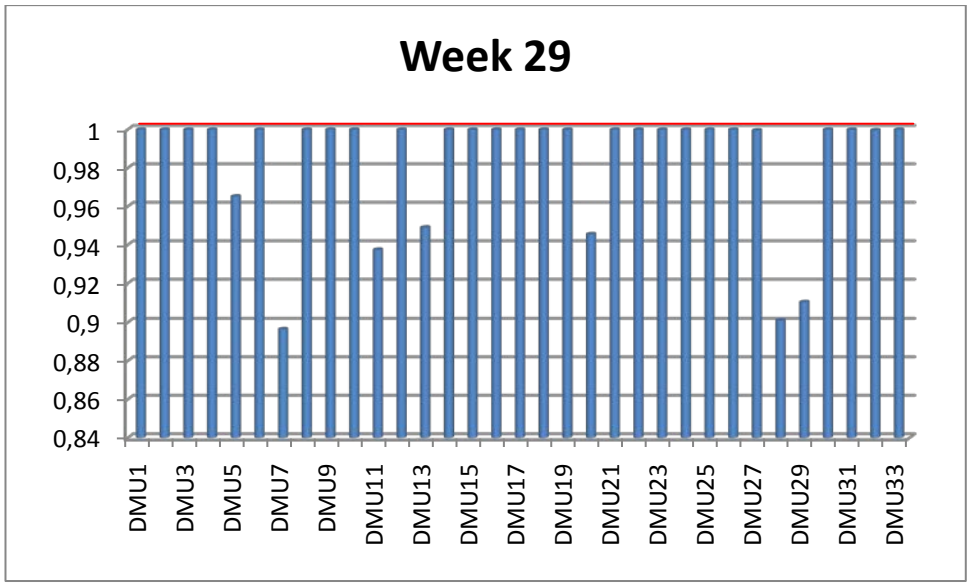

Figure 47 Efficiency Scores of DMUs in Week 29

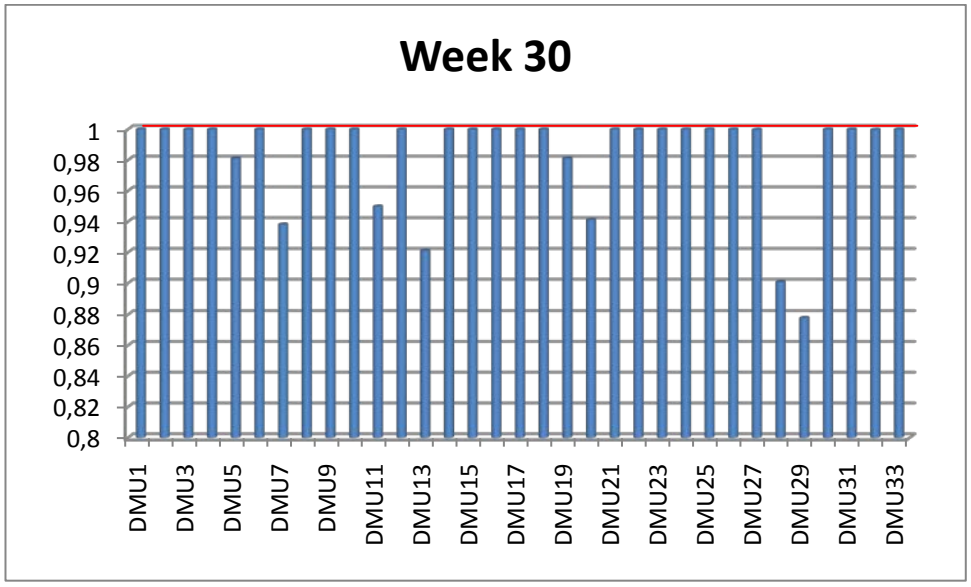

Figure 48 Efficiency Scores of DMUs in Week 30

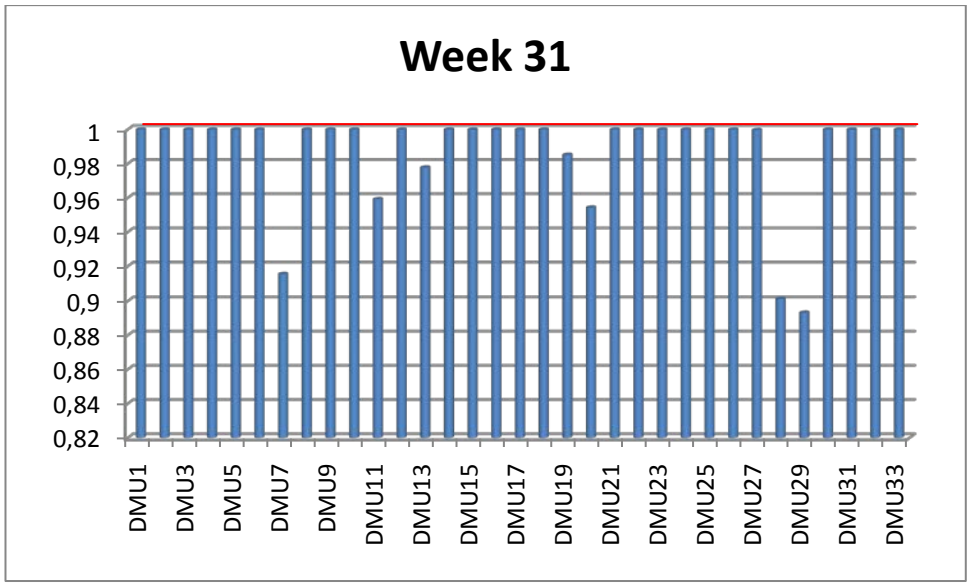

Figure 49 Efficiency Scores of DMUs in Week 31

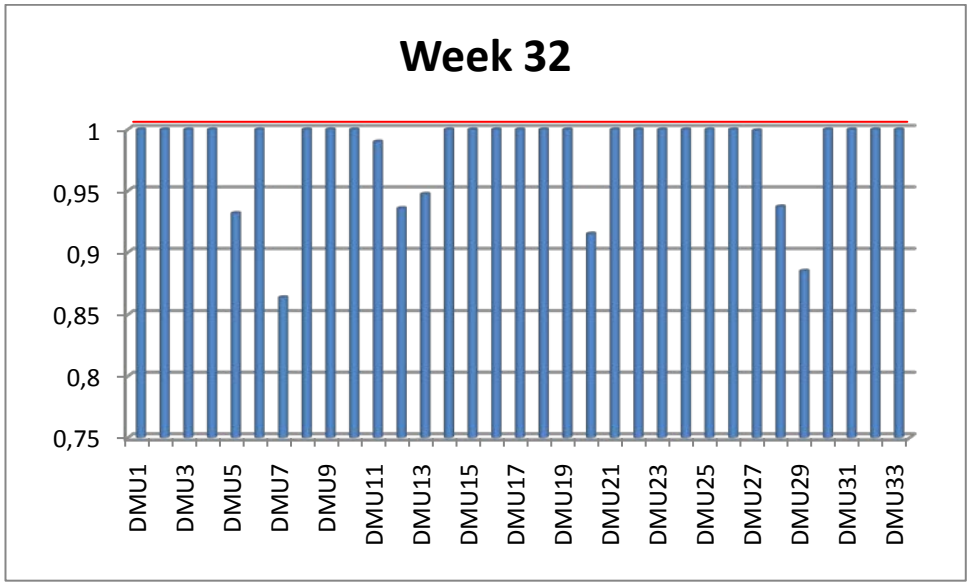

Figure 50 Efficiency Scores of DMUs in Week 32

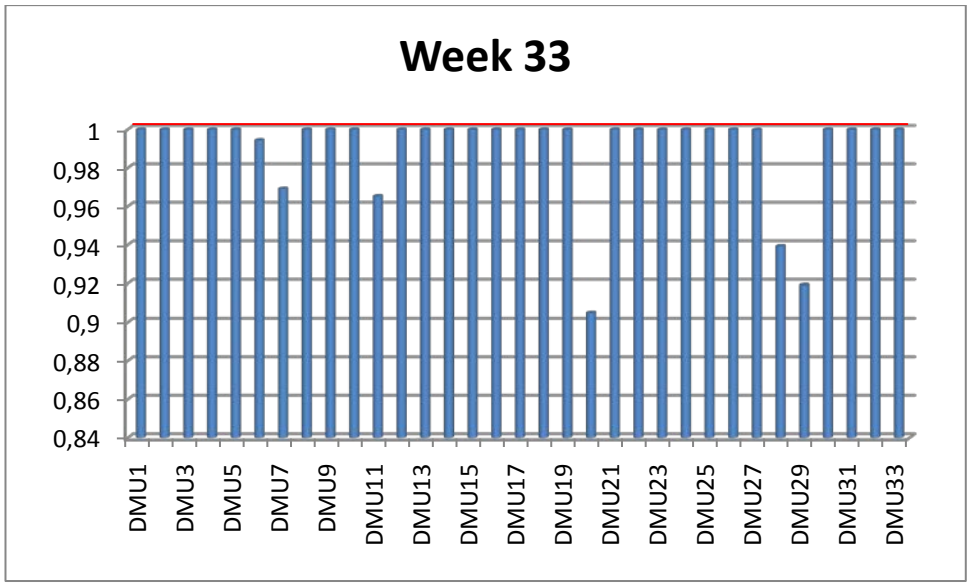

Figure 51 Efficiency Scores of DMUs in Week 33

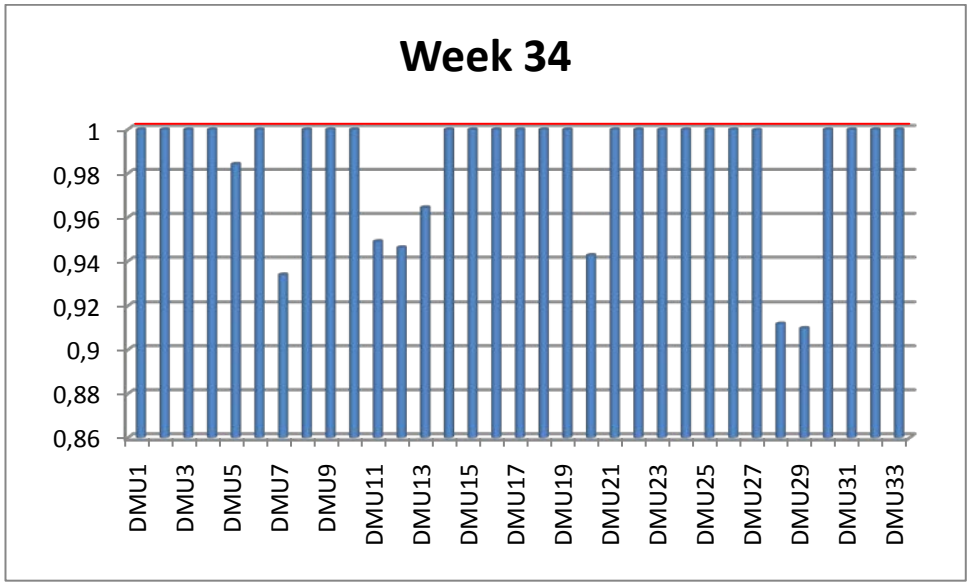

Figure 52 Efficiency Scores of DMUs in Week 34

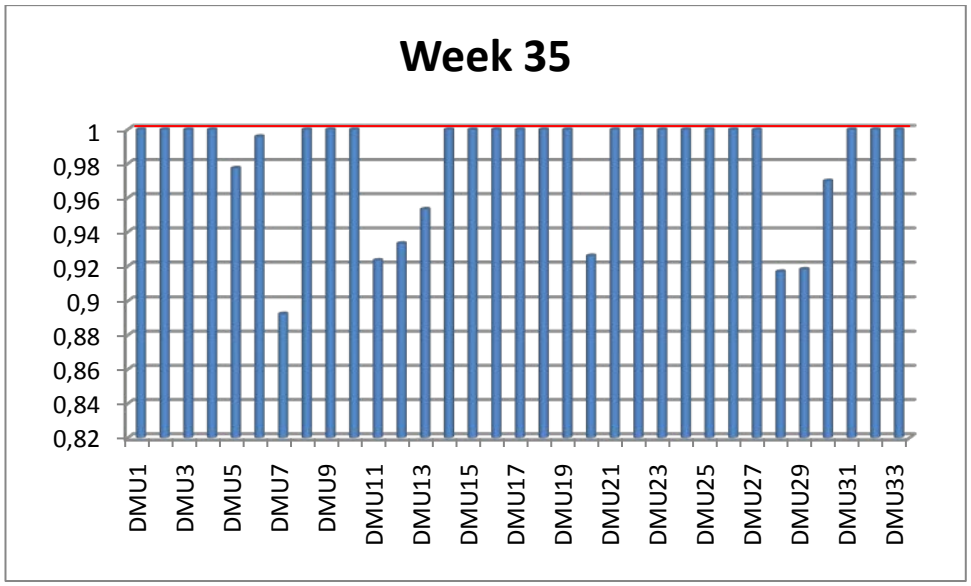

Figure 53 Efficiency Scores of DMUs in Week 35

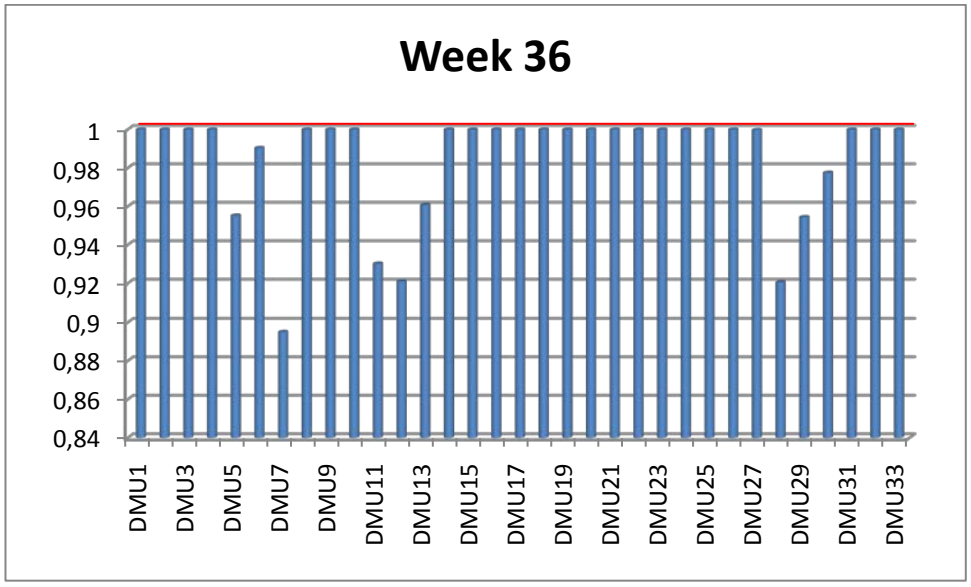

Figure 54 Efficiency Scores of DMUs in Week 36

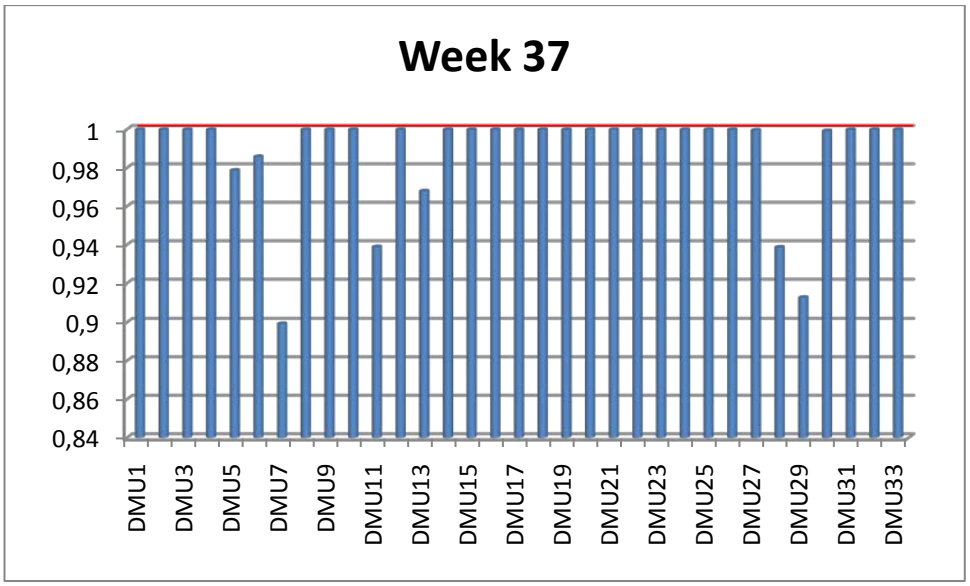

Figure 55 Efficiency Scores of DMUs in Week 37

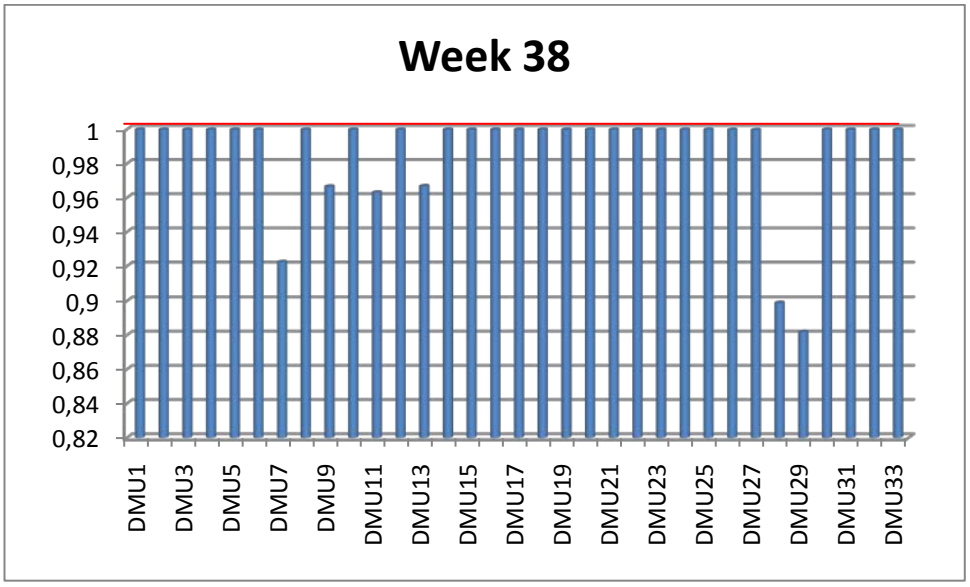

Figure 56 Efficiency Scores of DMUs in Week 38

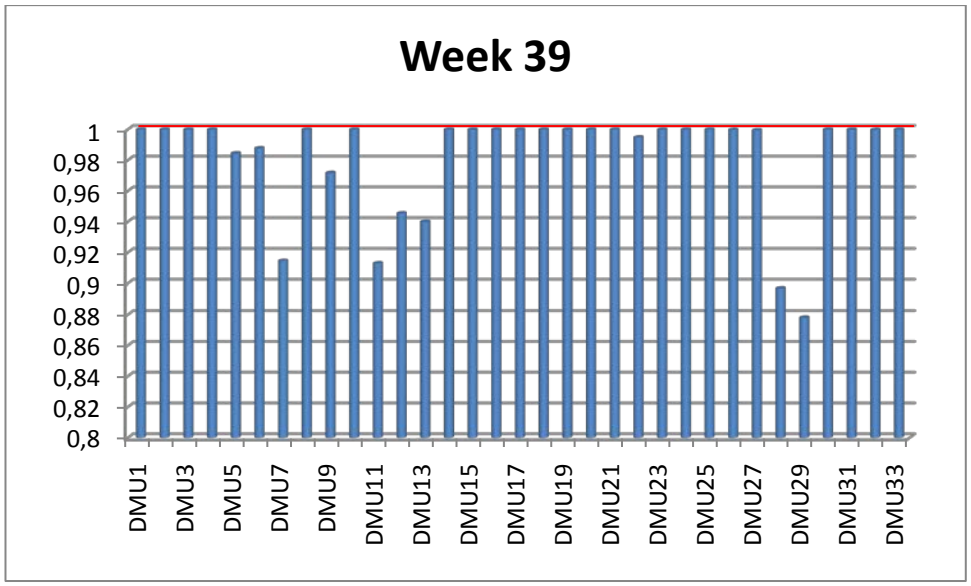

Figure 57 Efficiency Scores of DMUs in Week 39

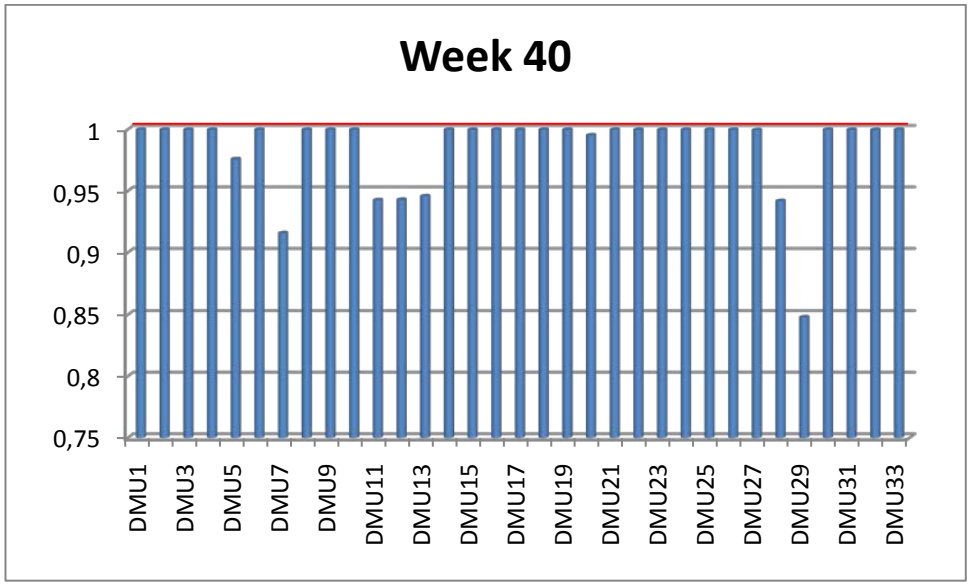

Figure 58 Efficiency Scores of DMUs in Week 40

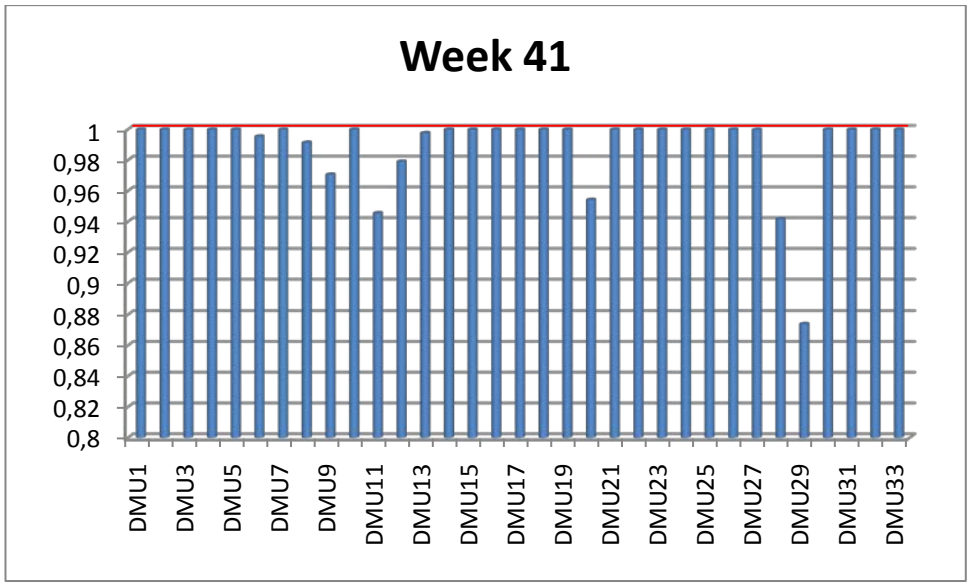

Figure 59 Efficiency Scores of DMUs in Week 41

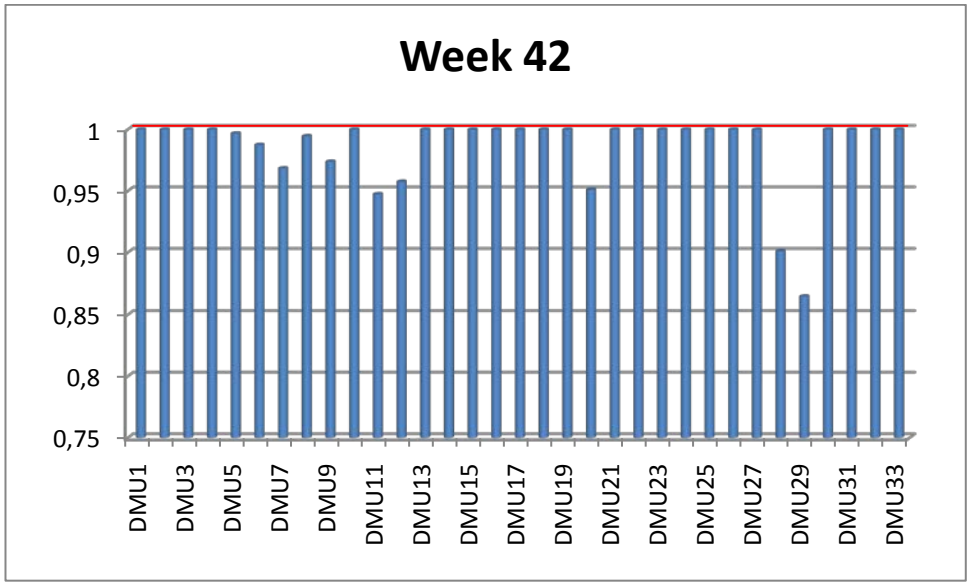

Figure 60 Efficiency Scores of DMUs in Week 42

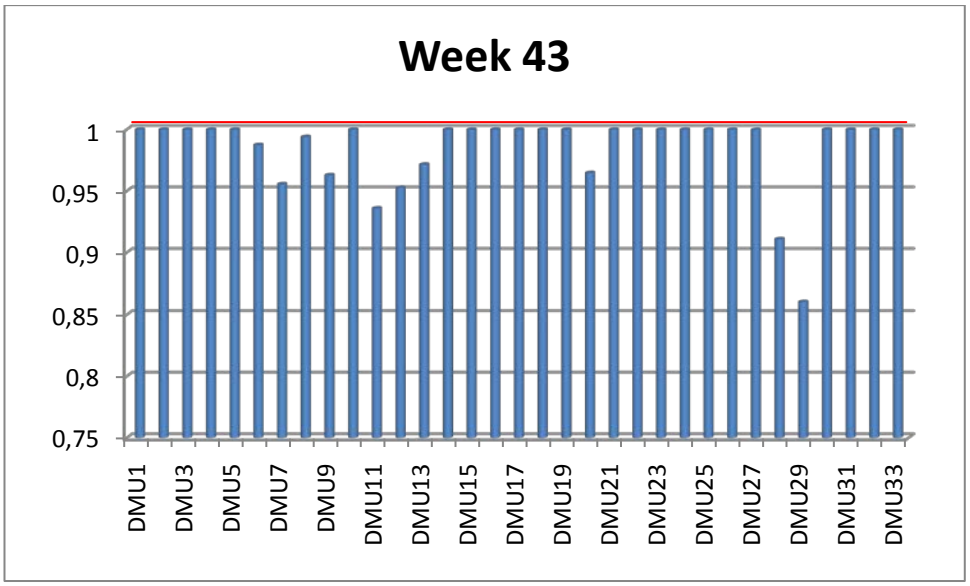

Figure 61 Efficiency Scores of DMUs in Week 43

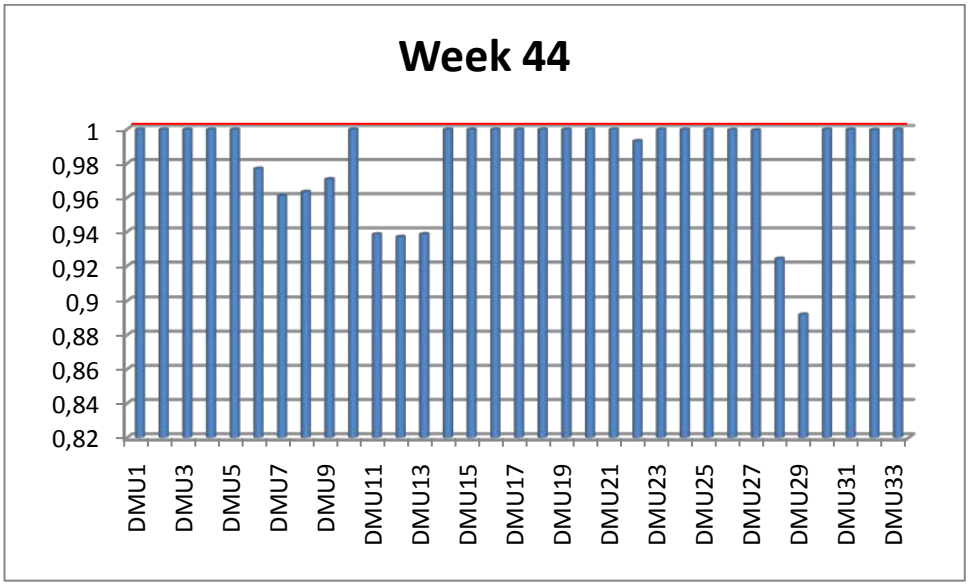

Figure 62 Efficiency Scores of DMUs in Week 44

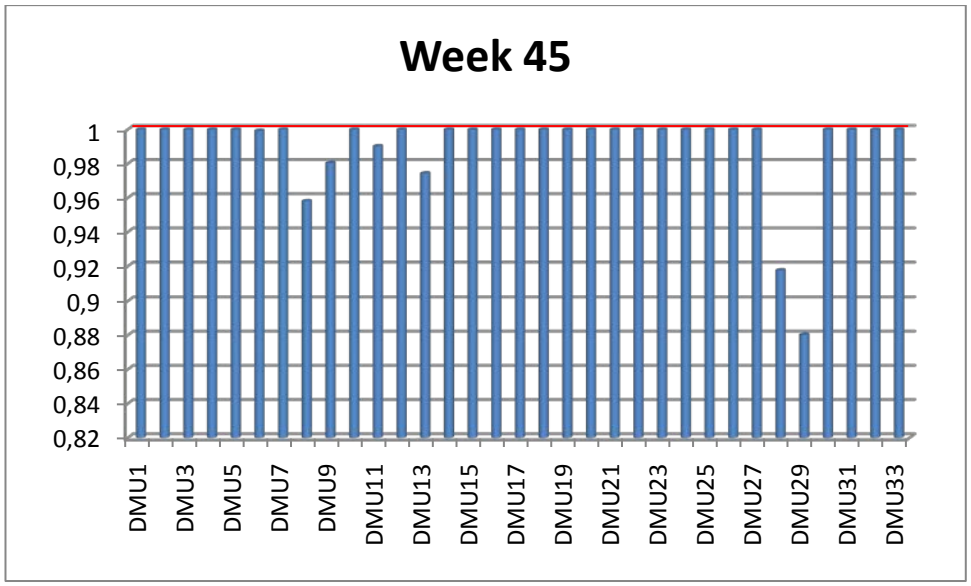

Figure 63 Efficiency Scores of DMUs in Week 45

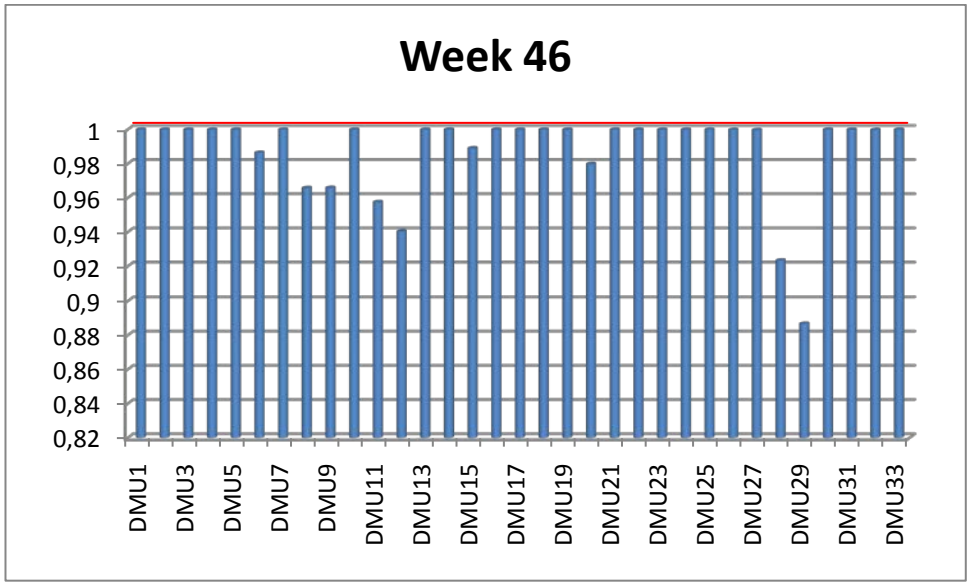

Figure 64 Efficiency Scores of DMUs in Week 46

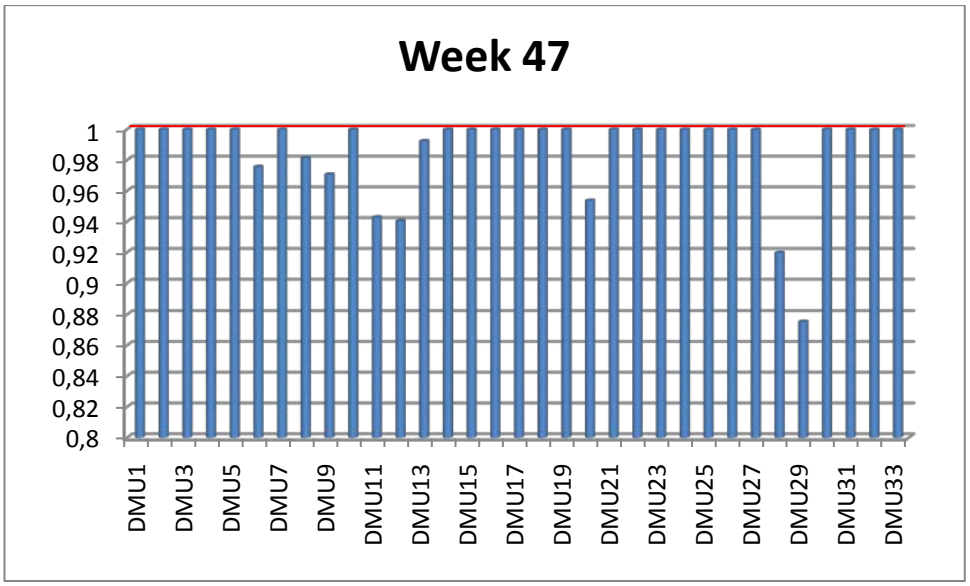

Figure 65 Efficiency Scores of DMUs in Week 47

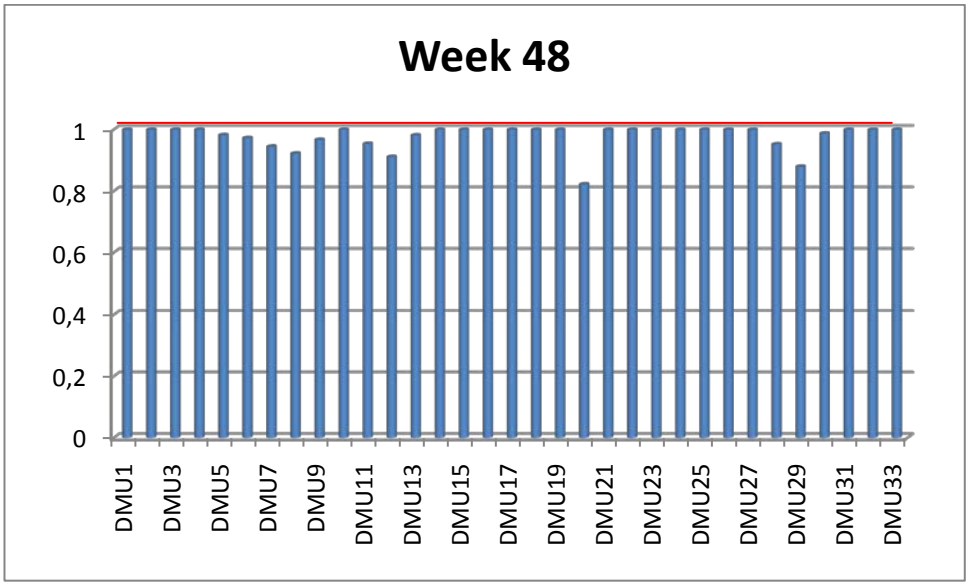

Figure 66 Efficiency Scores of DMUs in Week 48

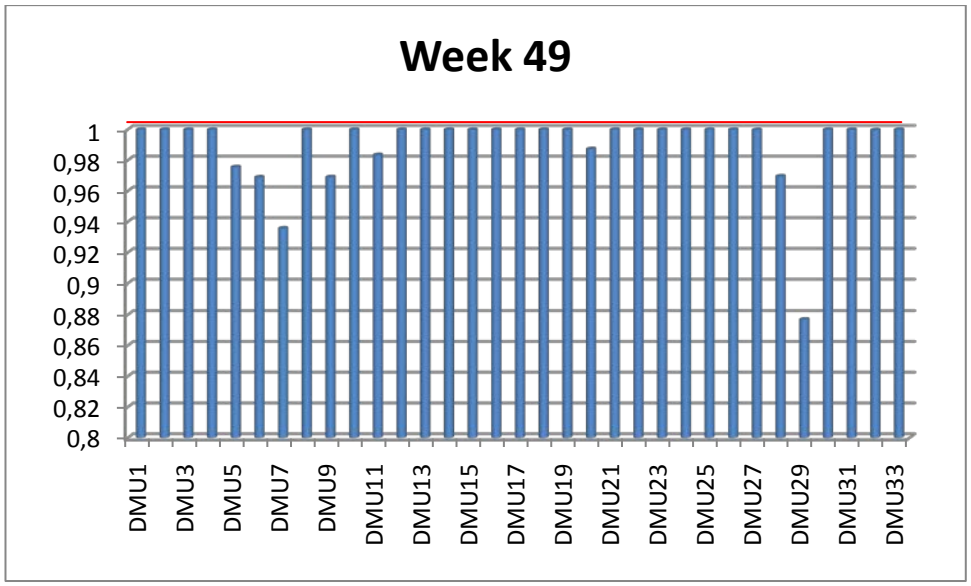

Figure 67 Efficiency Scores of DMUs in Week 49

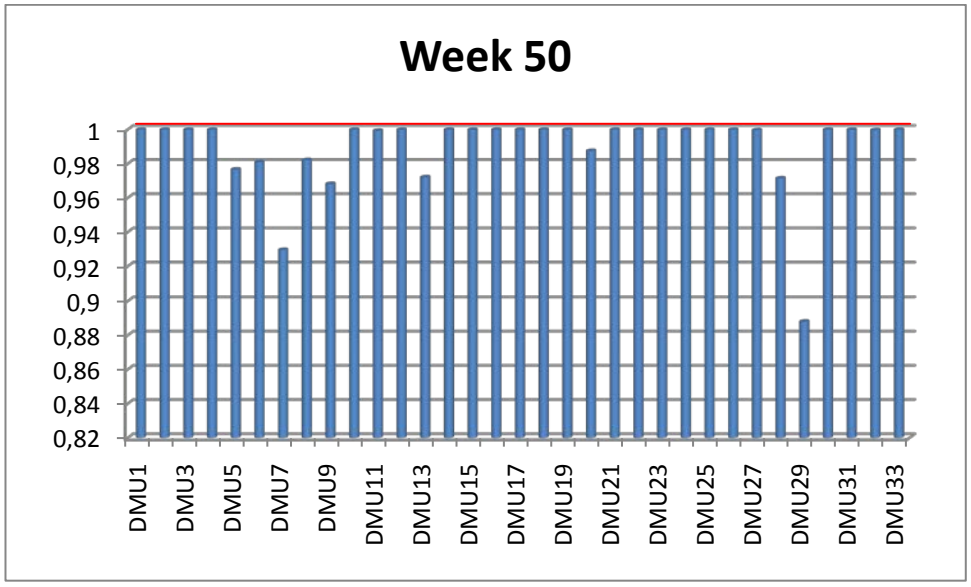

Figure 68 Efficiency Scores of DMUs in Week 50

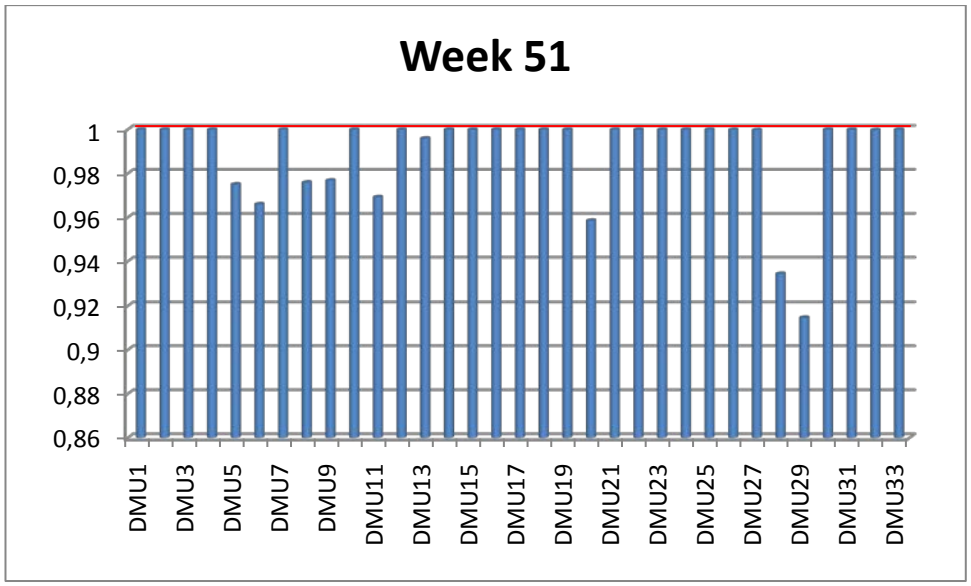

Figure 69 Efficiency Scores of DMUs in Week 51

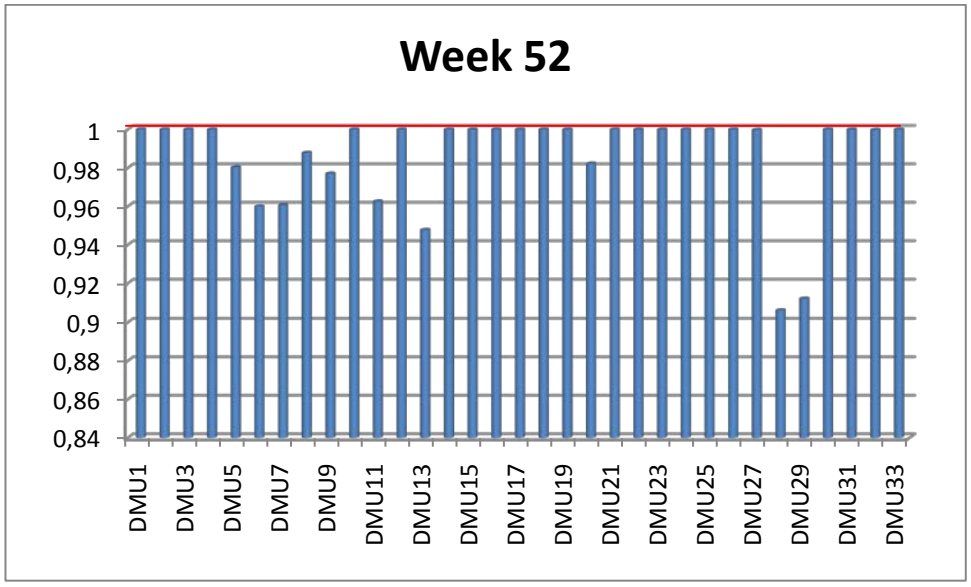

Figure 70 Efficiency Scores of DMUs in Week 52

APPENDIX 3

EFFICIENCY SCORES OF EACH DECISION MAKING UNIT OVER WEEKS

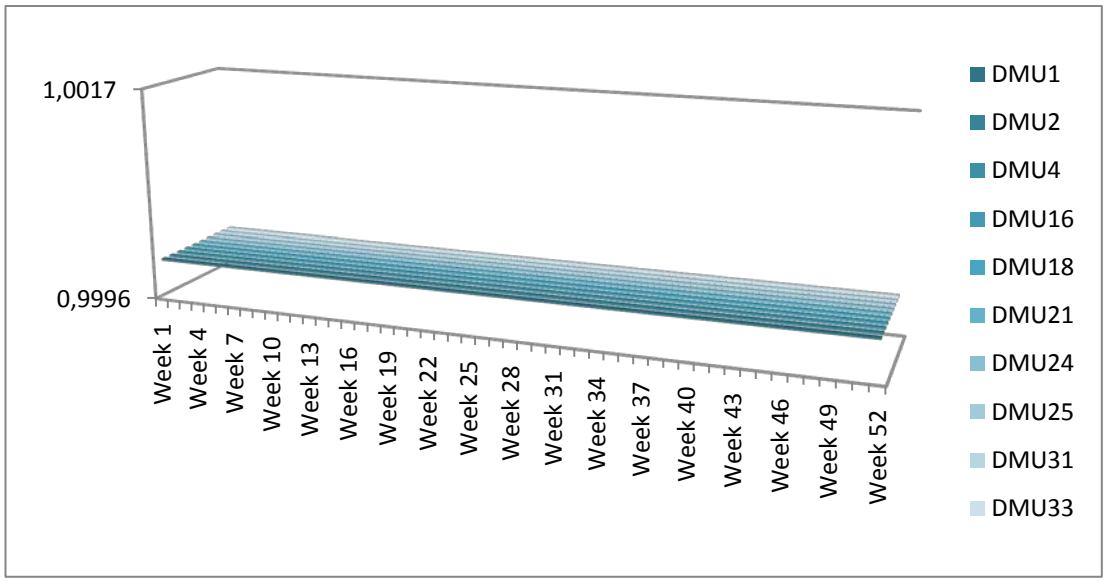

Figure 71 Efficiency Scores of Retail Store 1, 2, 4, 16, 18, 21, 24, 25 and 31 among Weeks

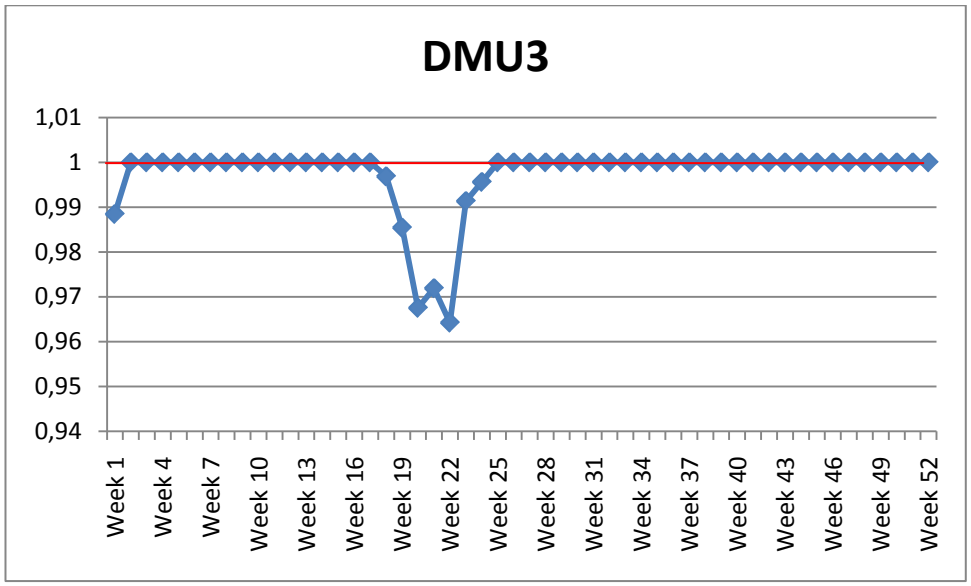

Figure 72 Efficiency Scores of DMU 3 among Weeks

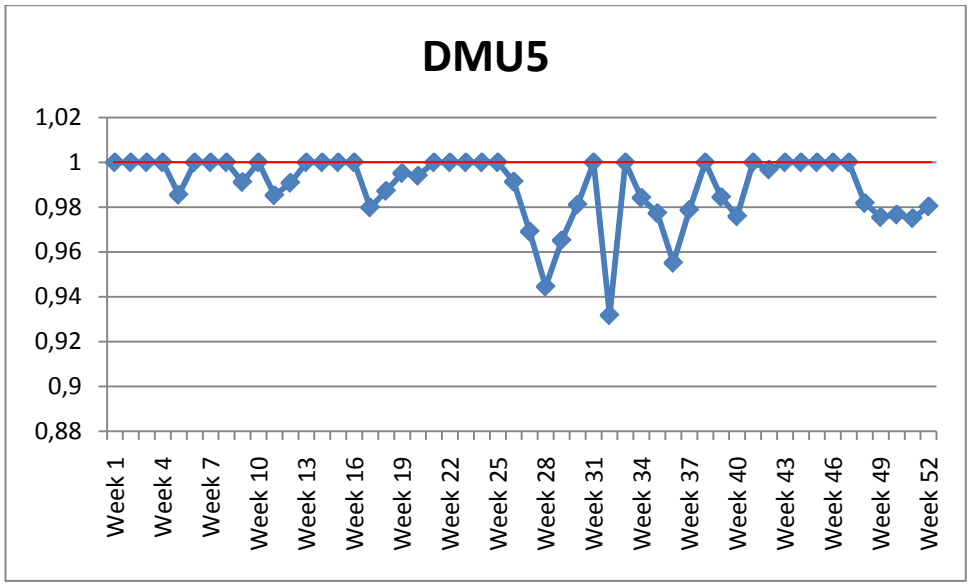

Figure 73 Efficiency Scores of DMU5 among Weeks

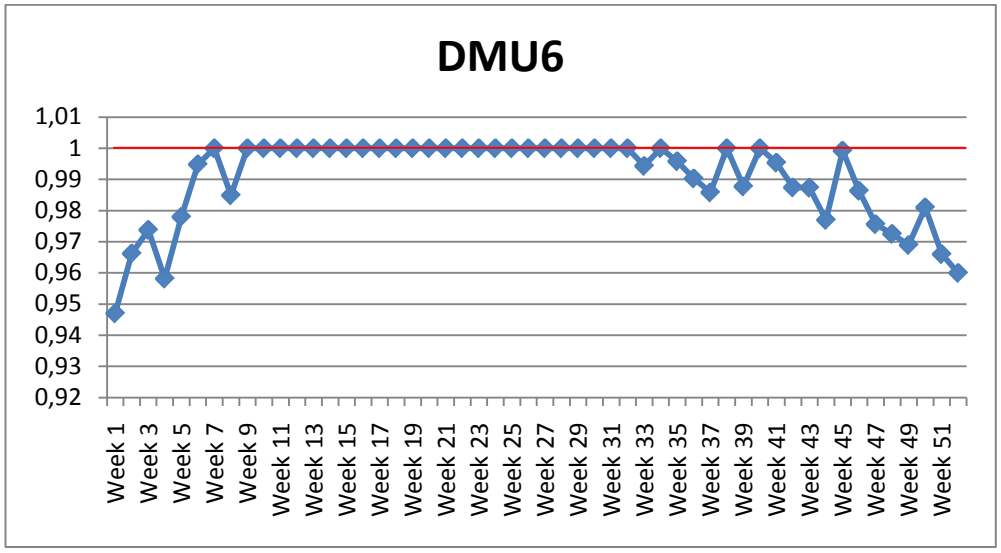

Figure 74 Efficiency Scores of DMU6 among Weeks

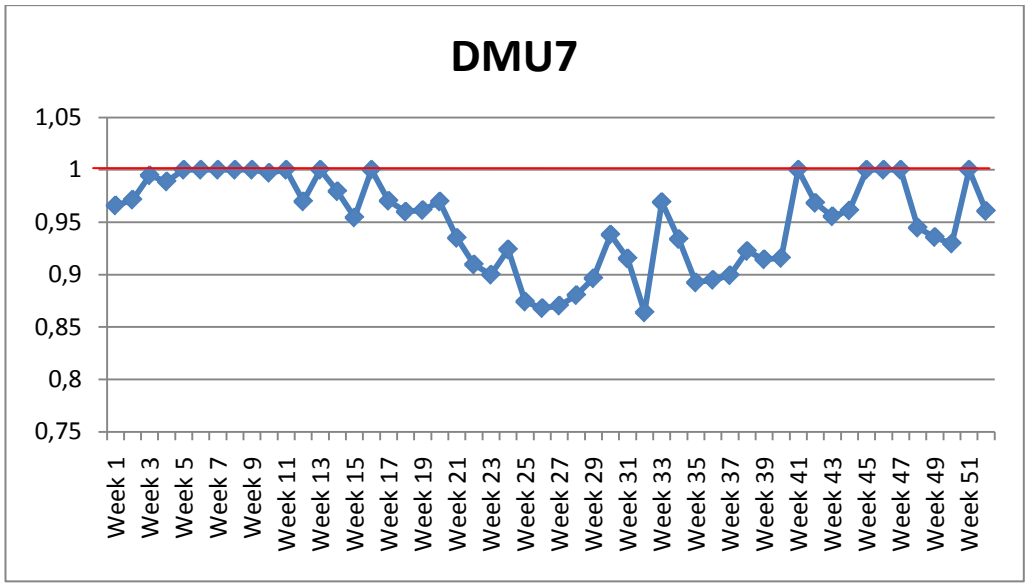

Figure 75 Efficiency Scores of DMU 7 among Weeks

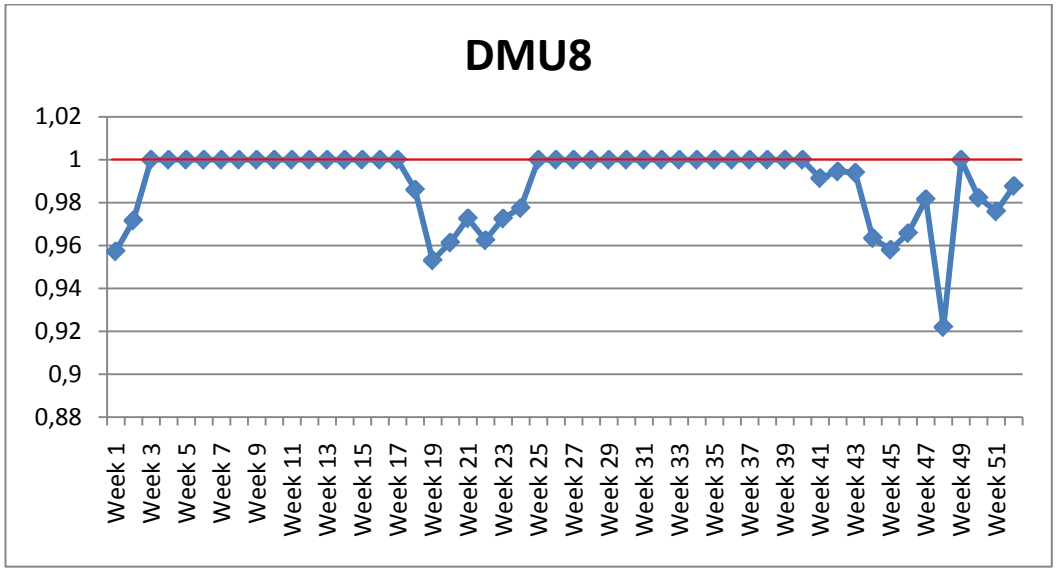

Figure 76 Efficiency Scores of DMU 8 Among Weeks

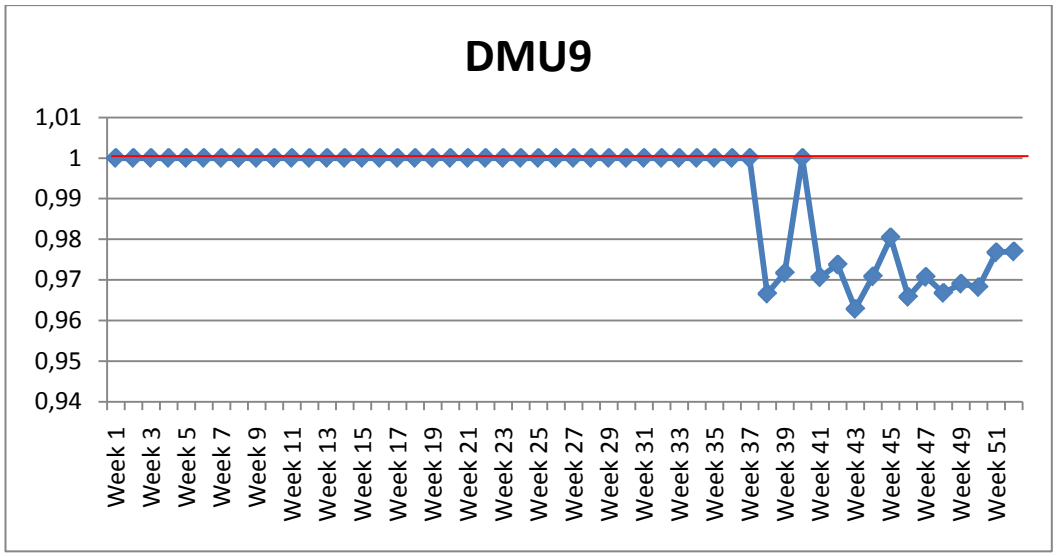

Figure 77 Efficiency Scores of DMU 9 Among Weeks

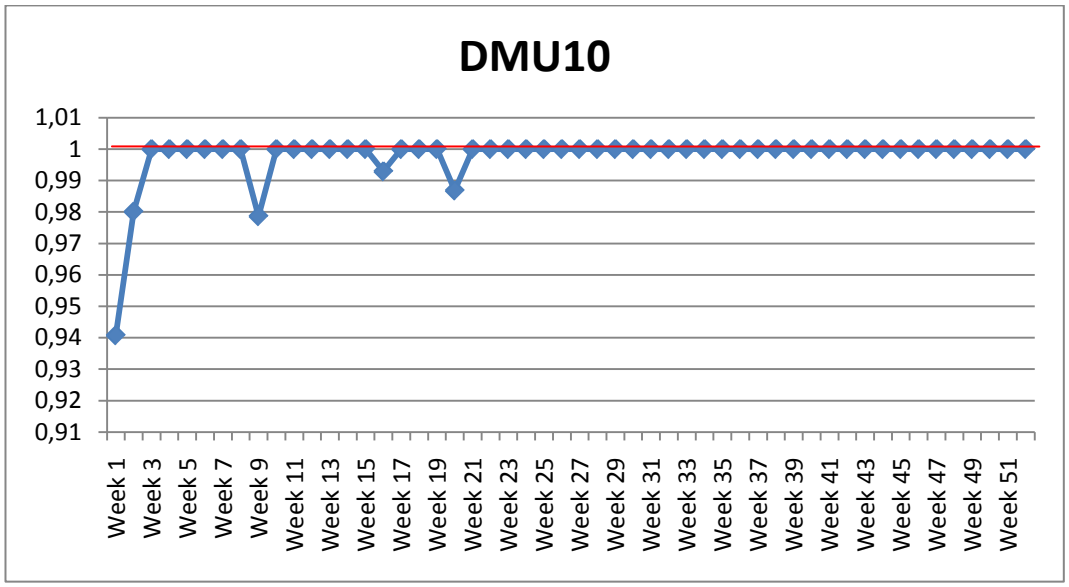

Figure 78 Efficiency Scores of DMU 10 Among Weeks

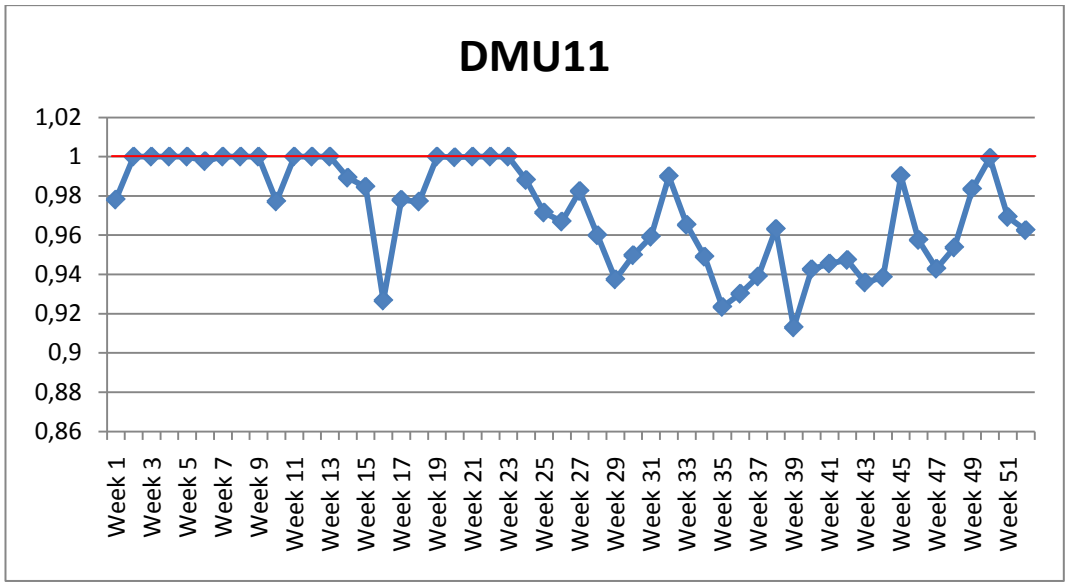

Figure 79 Efficiency Scores of DMU 11 Among Weeks

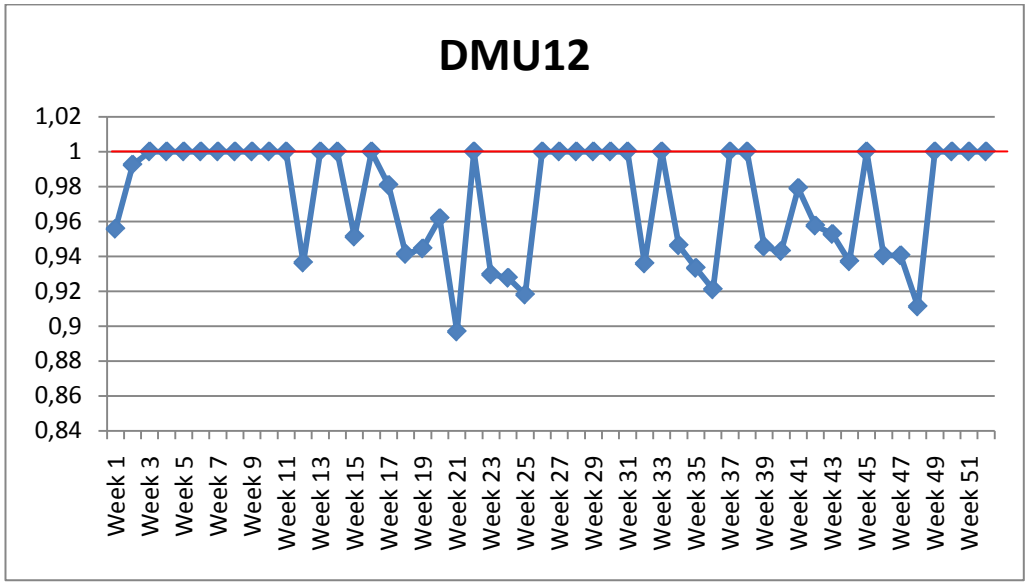

Figure 80 Efficiency Scores of DMU 12 Among Weeks

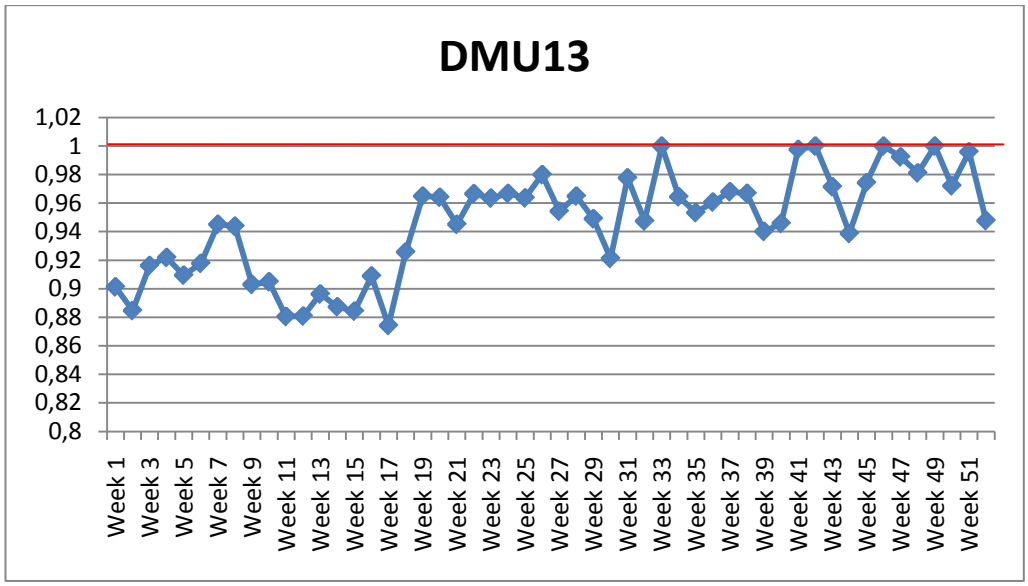

Figure 81 Efficiency Scores of DMU 13 Among Weeks

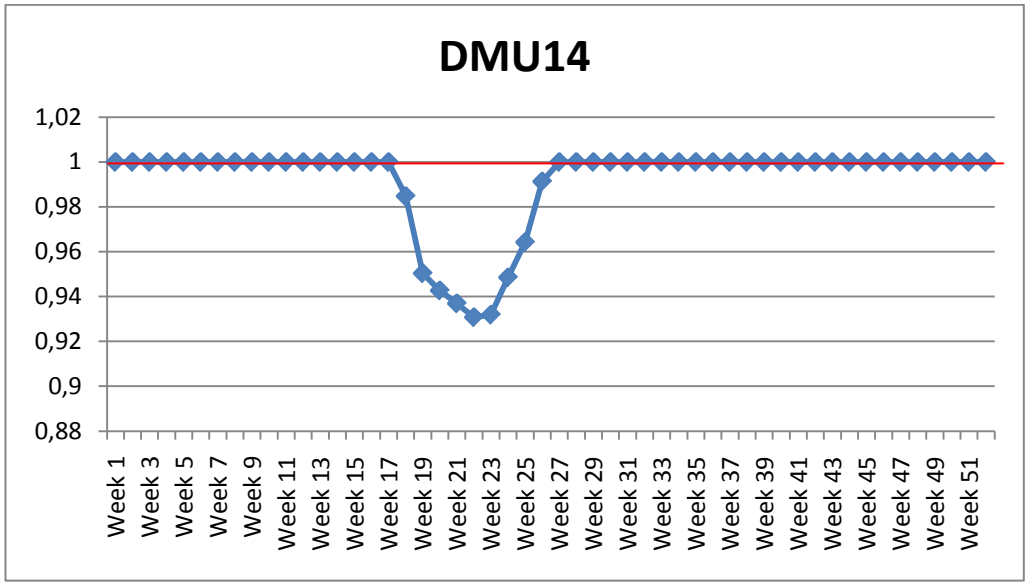

Figure 82 Efficiency Scores of DMU 14 among Weeks

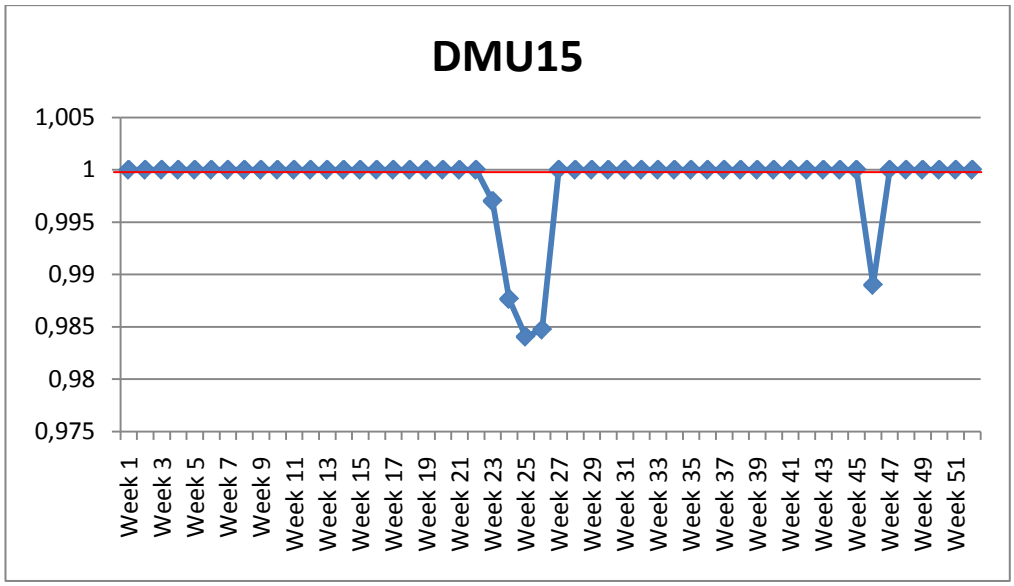

Figure 83 Efficiency Scores of DMU 15 among Weeks

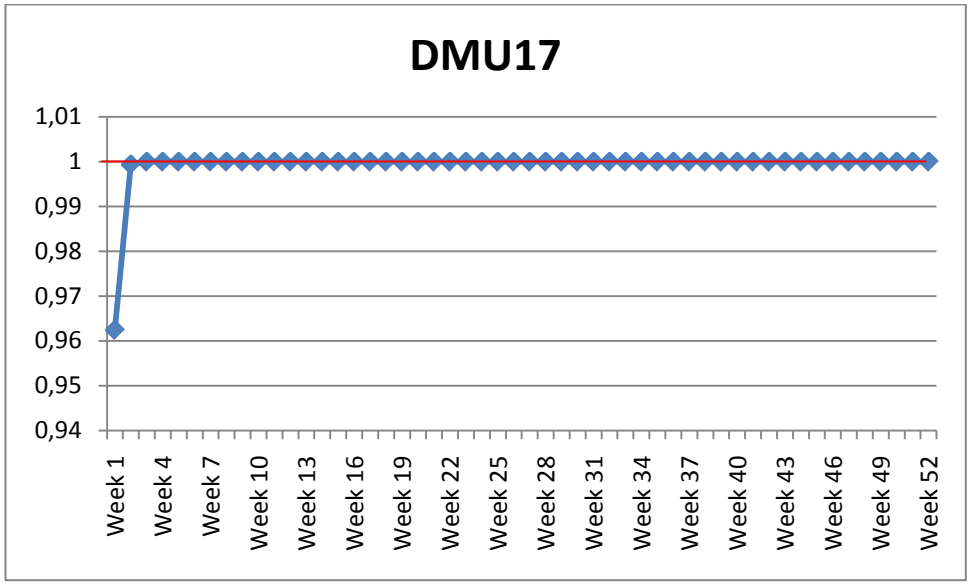

Figure 84 Efficiency Scores of DMU 17 among Weeks

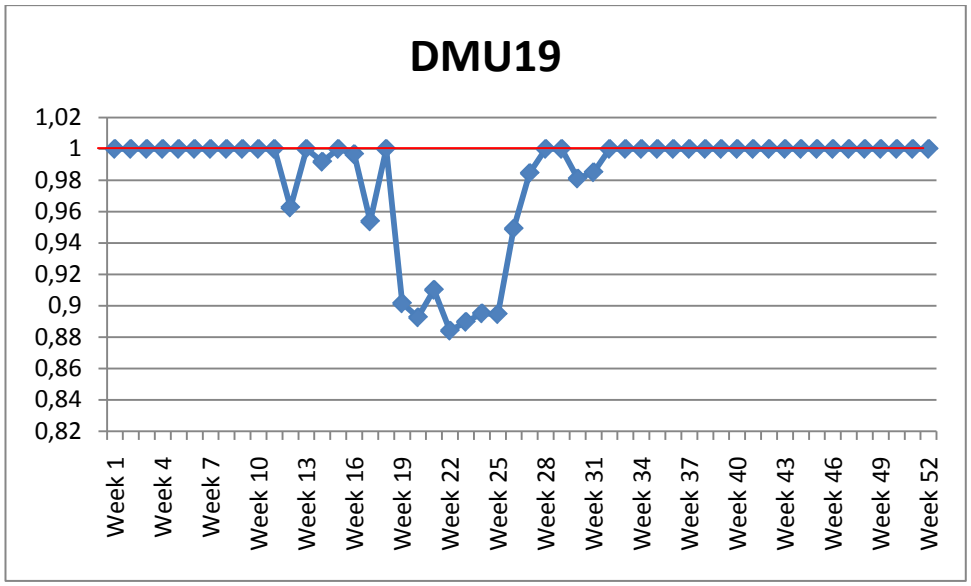

Figure 85 Efficiency Scores of DMU 19 among Weeks

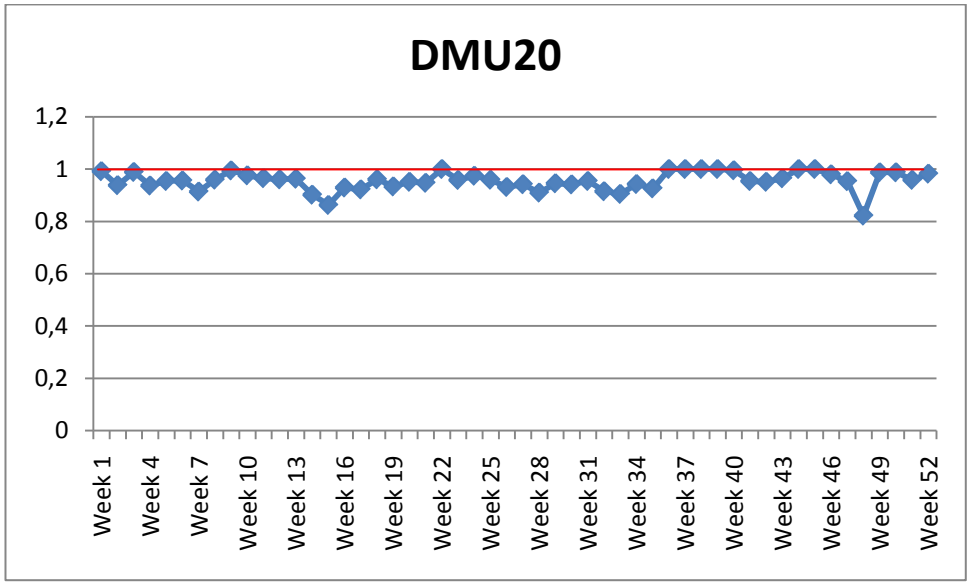

Figure 86 Efficiency Scores of DMU 20 among Weeks

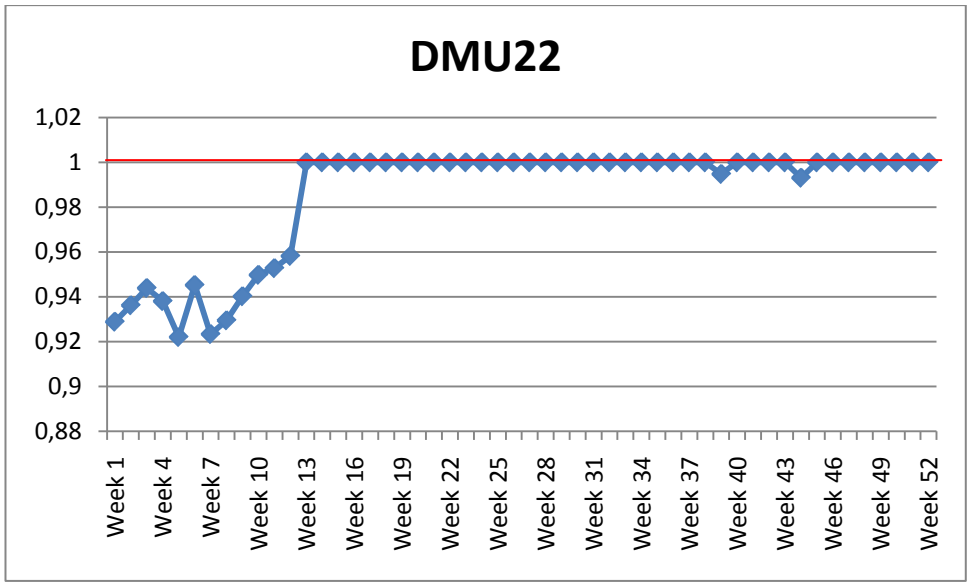

Figure 87 Efficiency Scores of DMU 22 among Weeks

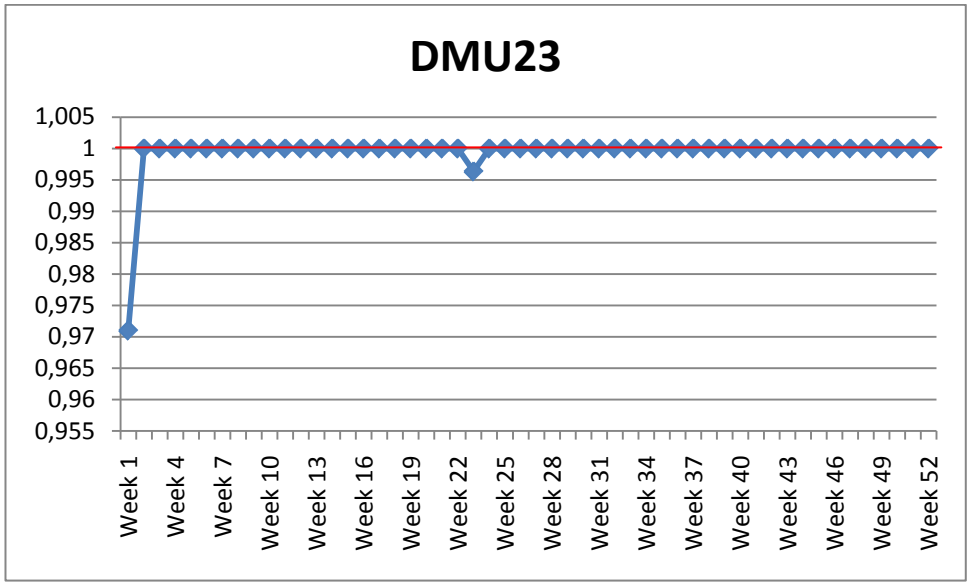

Figure 88 Efficiency Scores of DMU 23 among Weeks

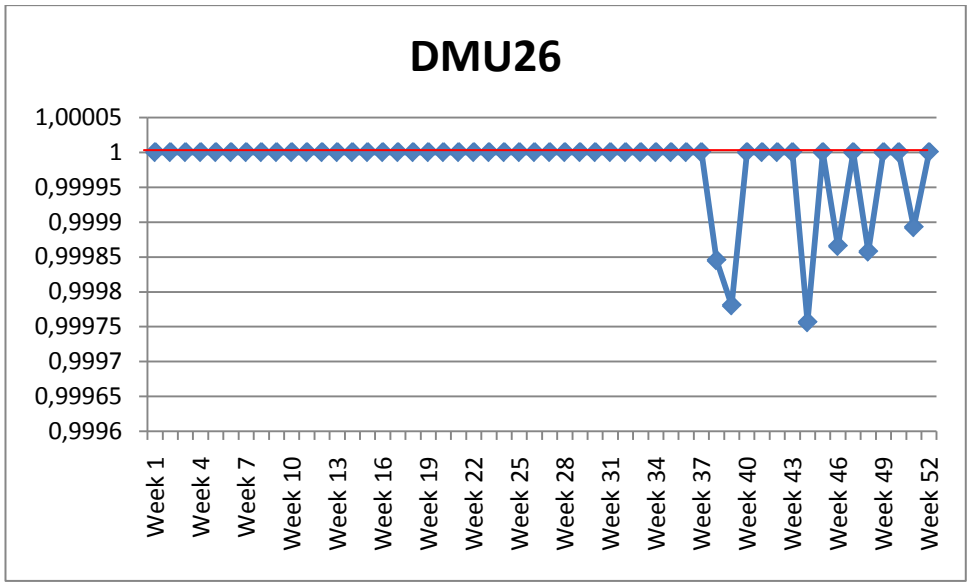

Figure 89 Efficiency Scores of DMU 26 among Weeks

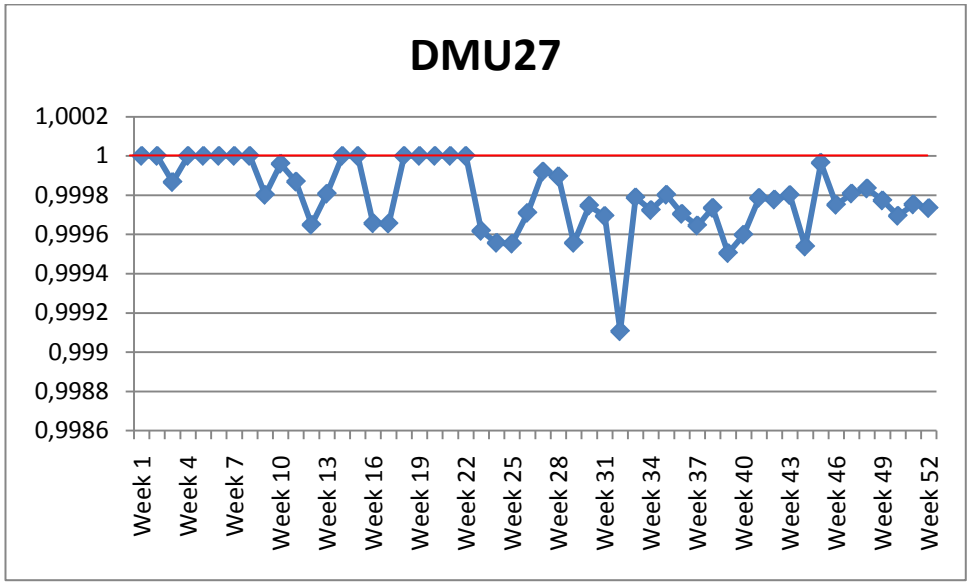

Figure 90 Efficiency Scores of DMU 27 among Weeks

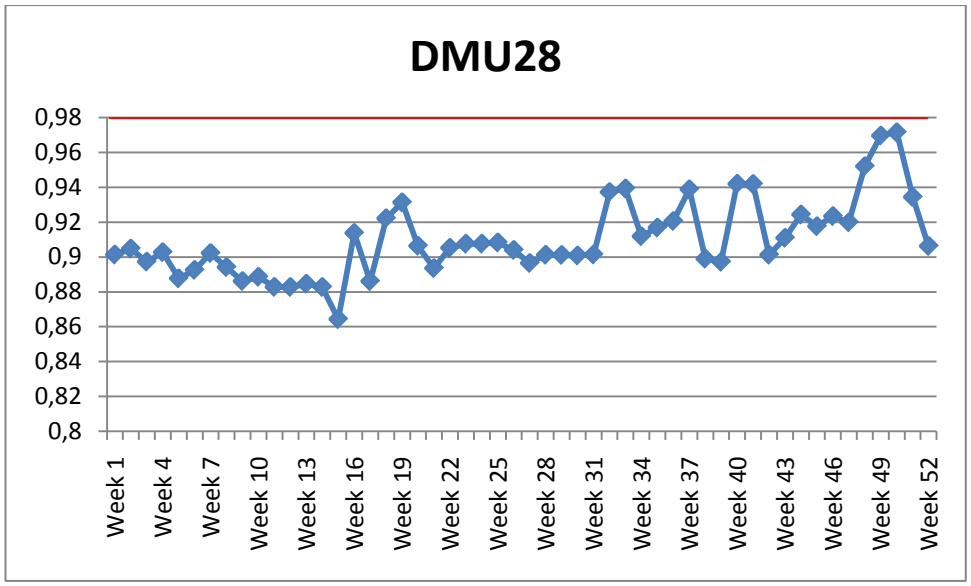

Figure 91 Efficiency Scores of DMU 28 among Weeks

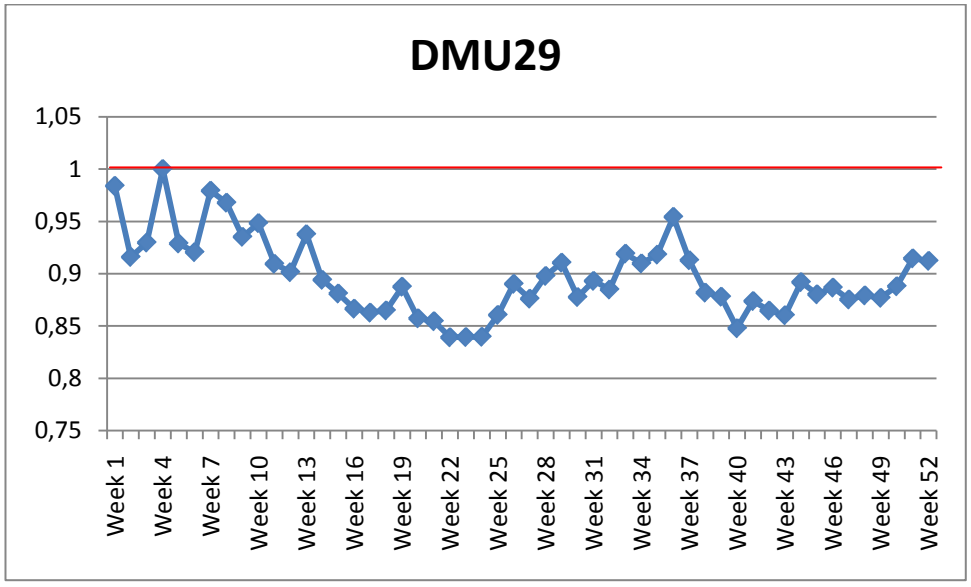

Figure 92 Efficiency Scores of DMU 29 among Weeks

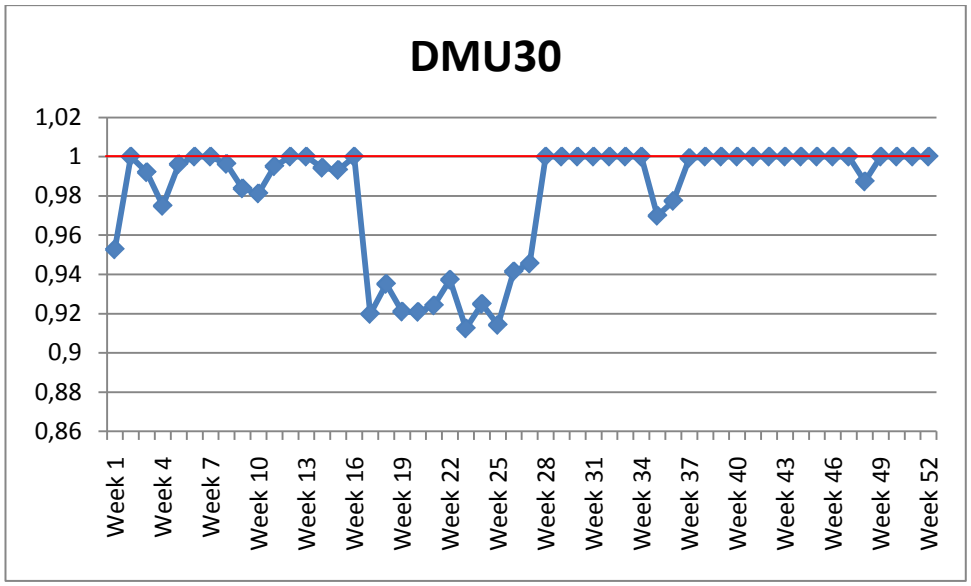

Figure 93 Efficiency Scores of DMU 30 among Weeks

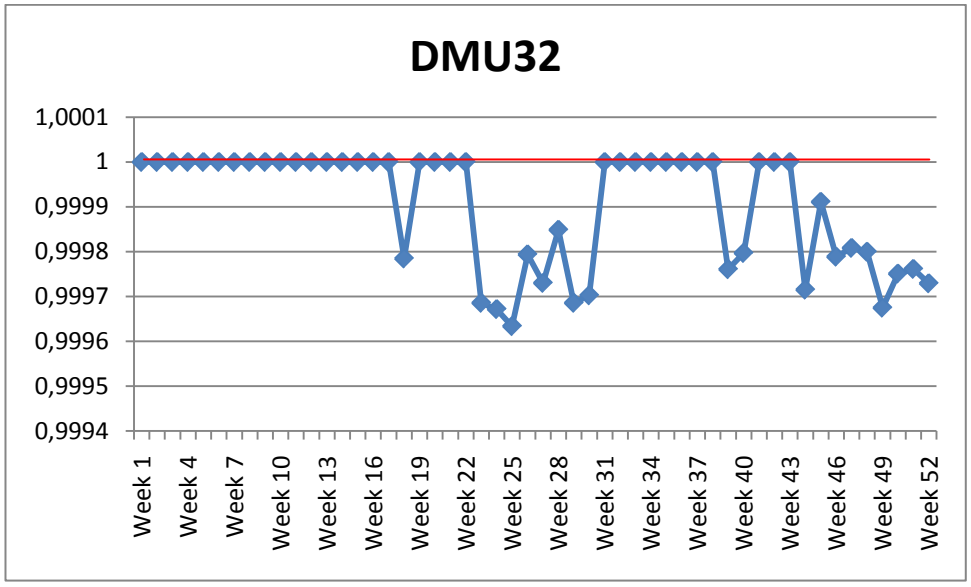

Figure 94 Efficiency Scores of DMU 32 among Weeks

APPENDIX 4

STANDARD DEVIATION OF WEIGHT OF INPUTS AND OUTPUTS OVER WEEKS FOR EACH DMU

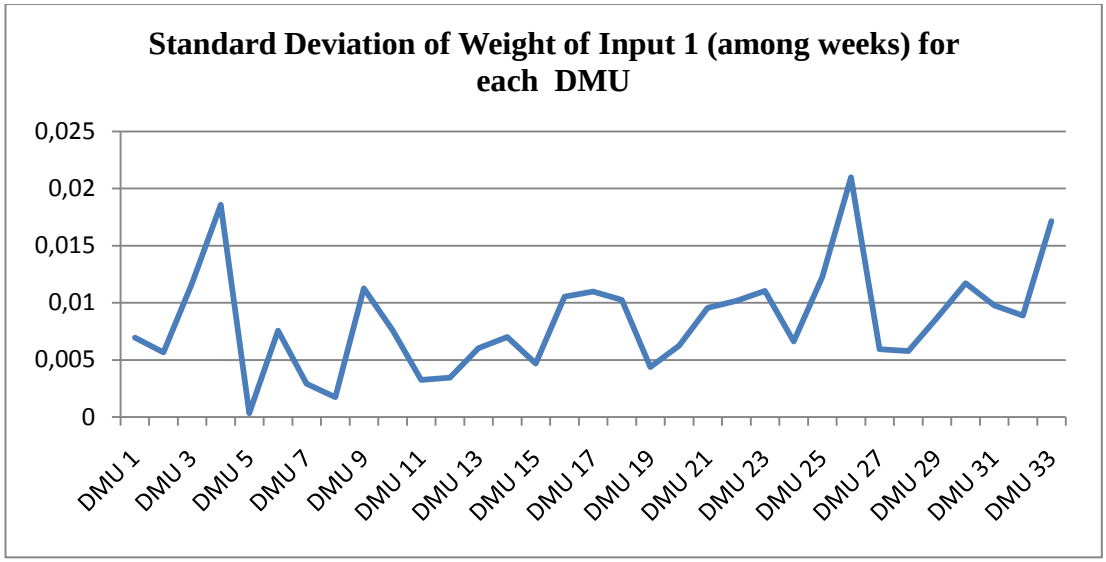

Figure 95 Standard Deviation of Weight of Input 1 (among weeks for each DMU) Input 1: Number of SKUs Displayed

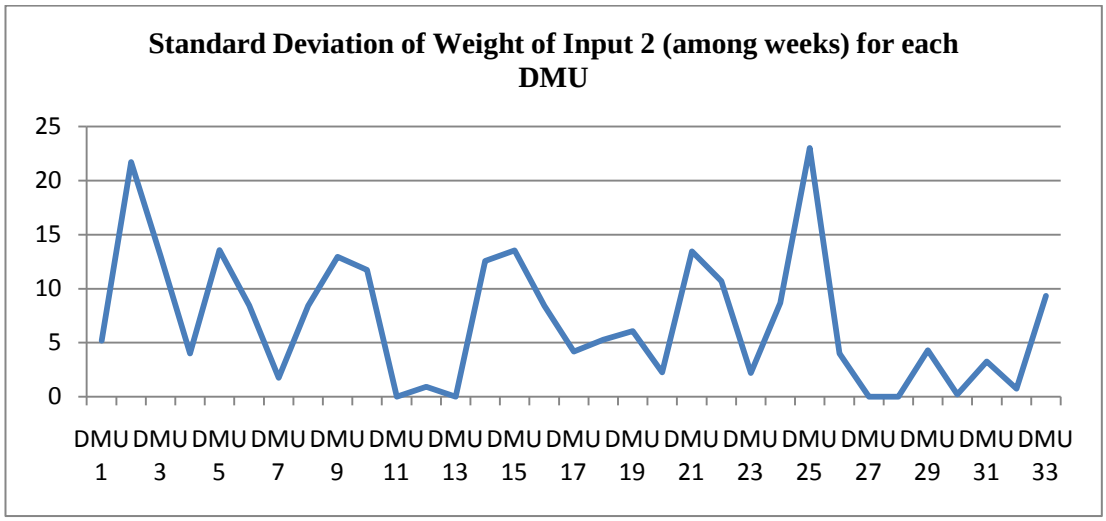

Figure 96 Standard Deviation of Weight of Input 2 (among weeks for each DMU) Input 2: Number of Check Out Points

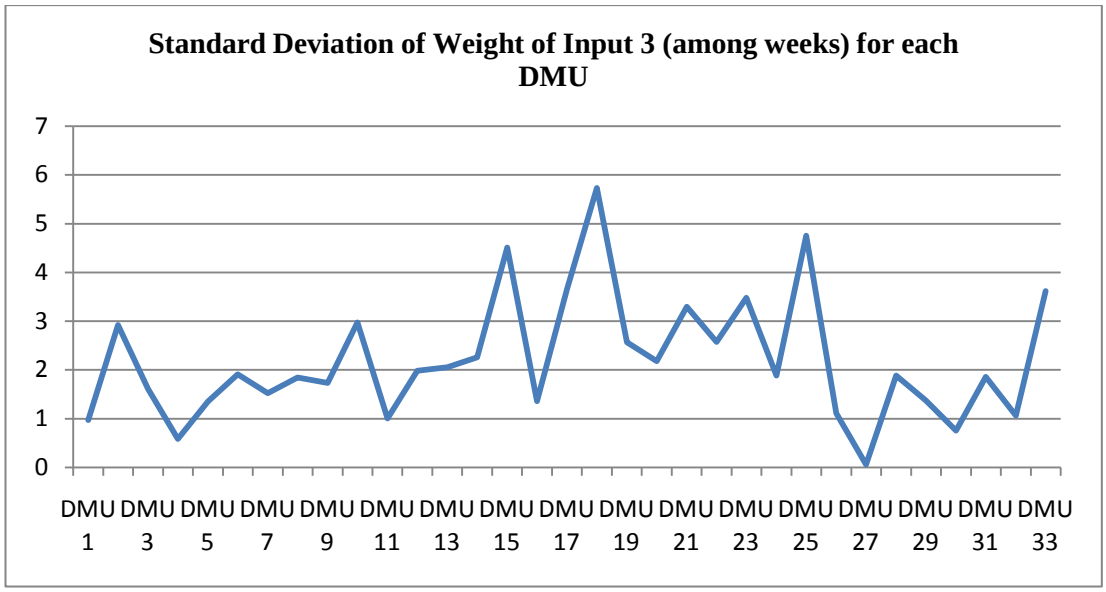

Figure 97 Standard Deviation of Weight of Input 3 (among weeks for each DMU)
Input 3: Number of Full Time Equivalent Personnel

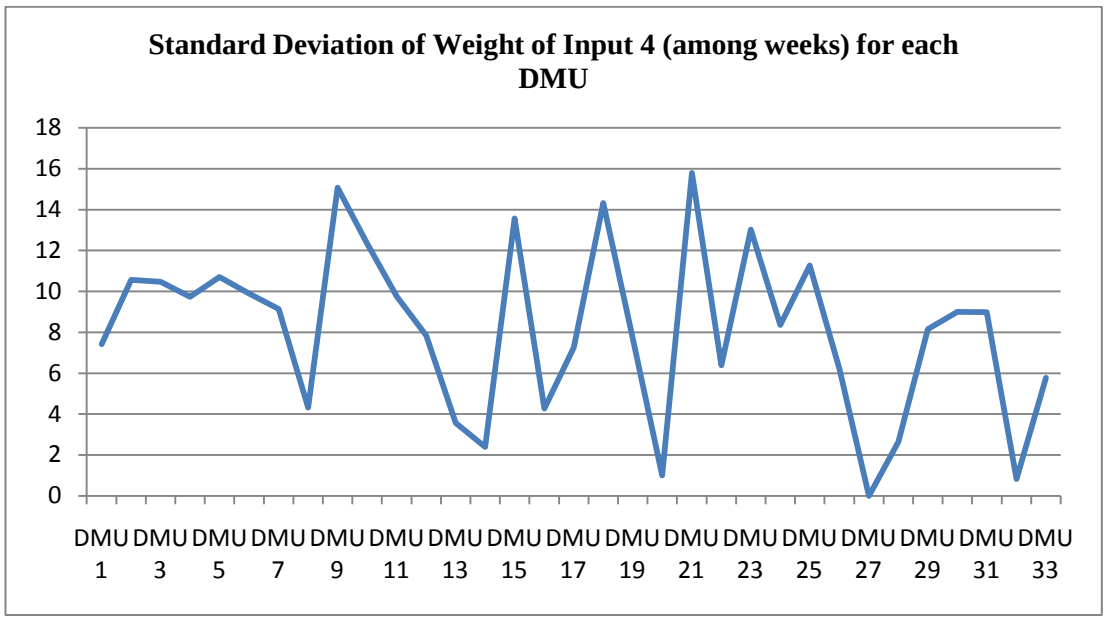

Figure 98 Standard Deviation of Weight of Input 4 (among weeks for each DMU)
Input 4: Shelf capacity

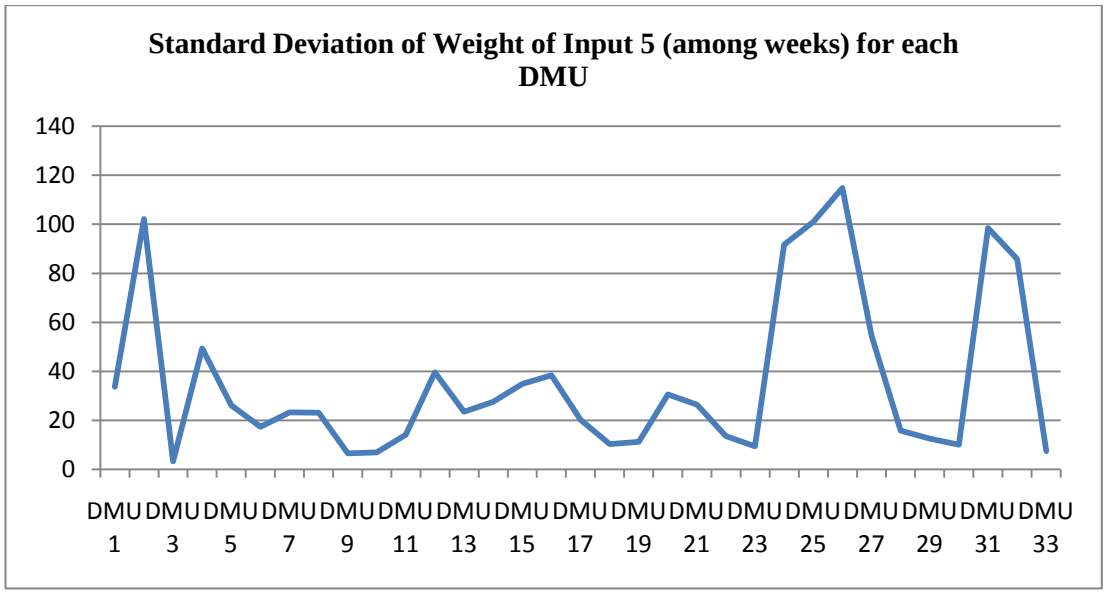

Figure 99 Standard Deviation of Weight of Input 5 (among weeks for each DMU)
Input 5: Delivery frequency

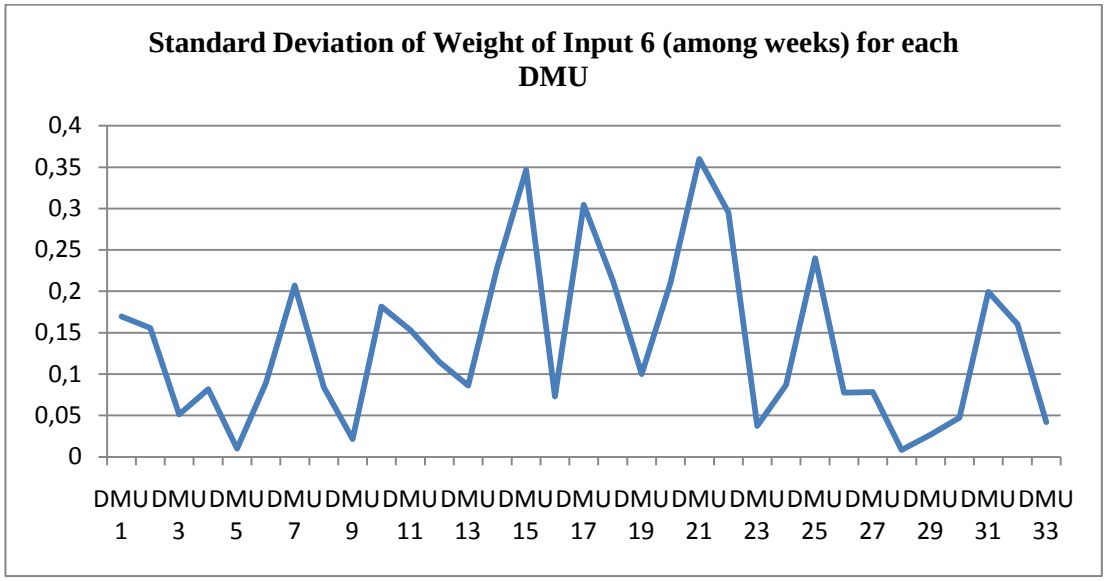

Figure 100 Standard Deviation of Weight of Input 6 (among weeks for each DMU)
Input 6: Number of Gaps

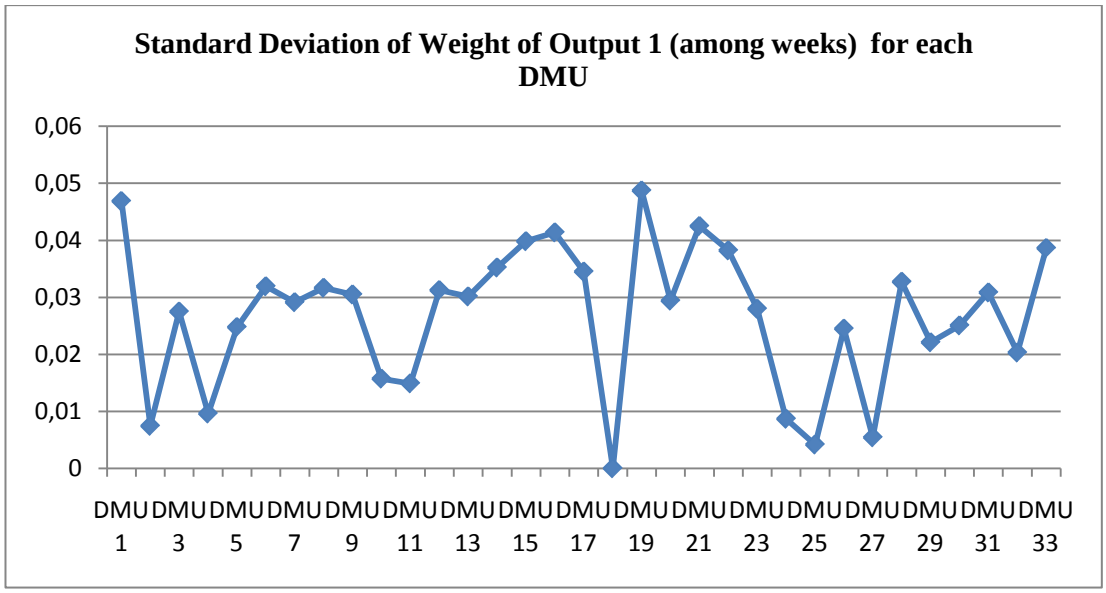

Figure 101 Standard Deviation of Weight of Output 1 (among weeks for each DMU)
Output 1: Number of SKUs Sold

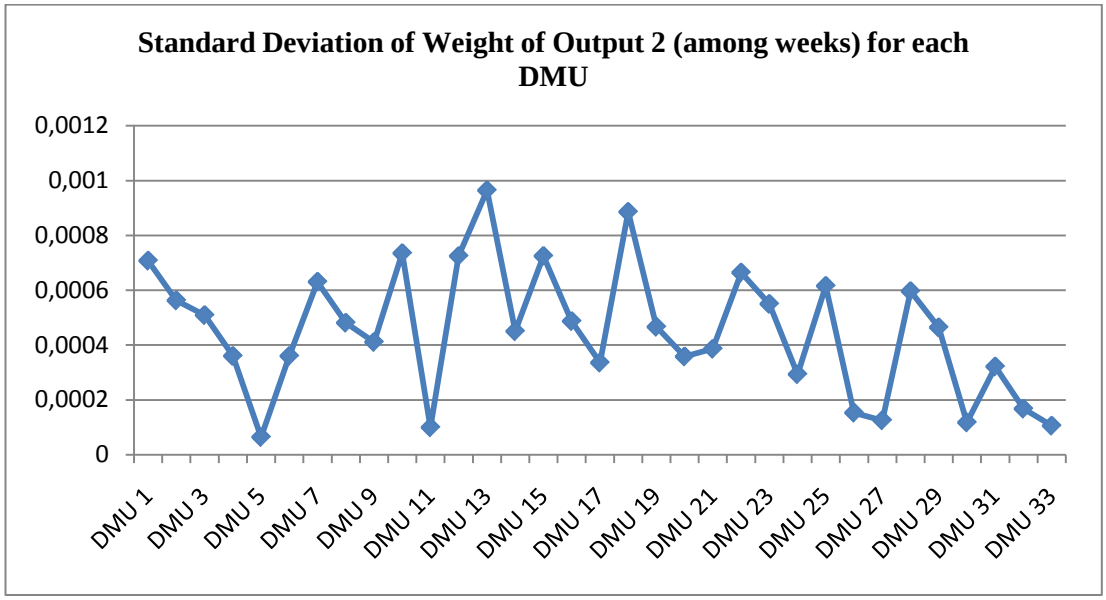

Figure 102 Standard Deviation of Weight of Output 2 (among weeks for each DMU)
Output 2: Number of Units Sold

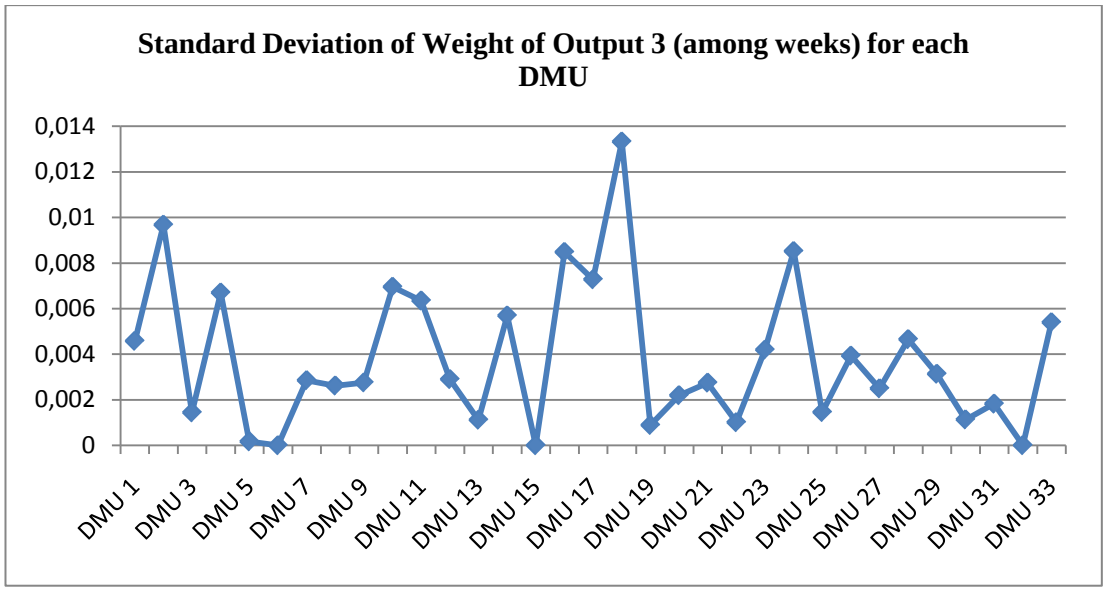

Figure 103 Standard Deviation of Weight of Output 3 (among weeks for each DMU) Output 3: Number of customers

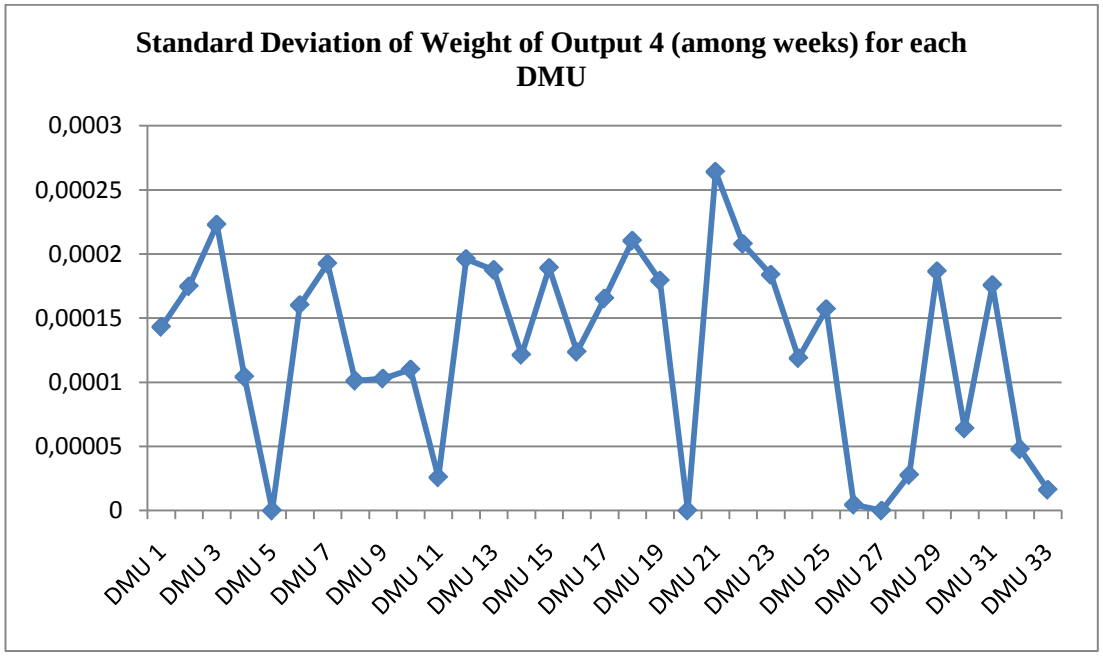

Figure 104 Standard Deviation of Weight of Output 4 (among weeks for each DMU) Output 4: Sales

APPENDIX 5

STANDARD DEVIATION OF WEIGHT OF INPUTS AND OUTPUTS AMONG DMUS FOR EACH WEEK

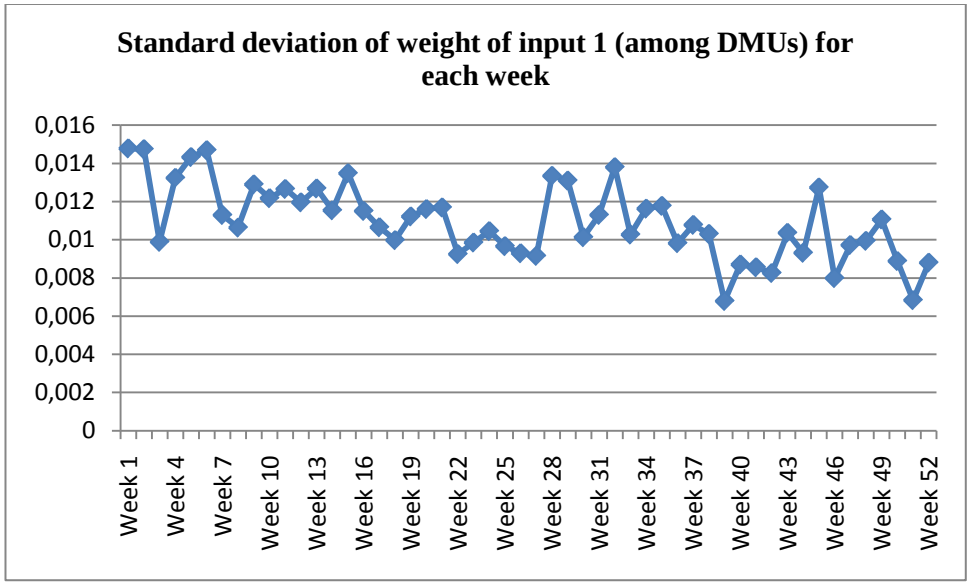

Figure 105 Standard Deviation of Weight of Input 1 (among DMUs for each week)
Input 1: Number of SKUs Displayed

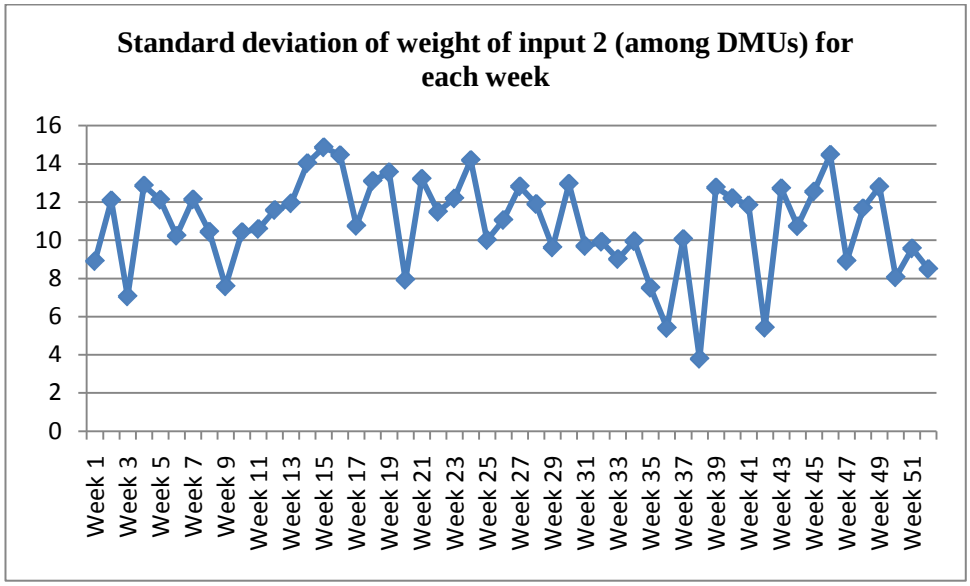

Figure 106 Standard Deviation of Weight of Input 2 (among DMUs for each week)
Input 2: Number of check out points

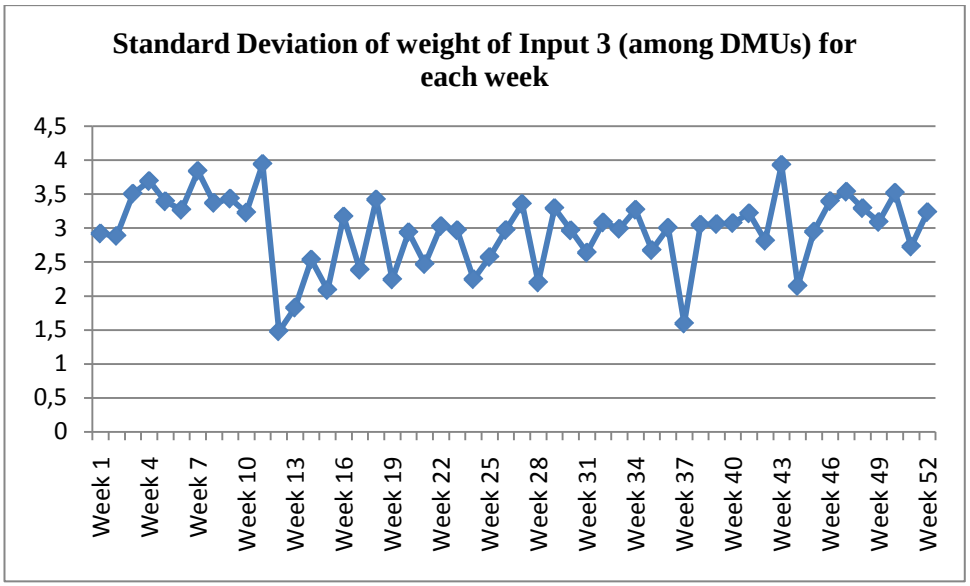

Figure 107 Standard Deviation of Weight of Input 3 (among DMUs for each week)
Input 3: Number of Full Time Equivalent Personnel

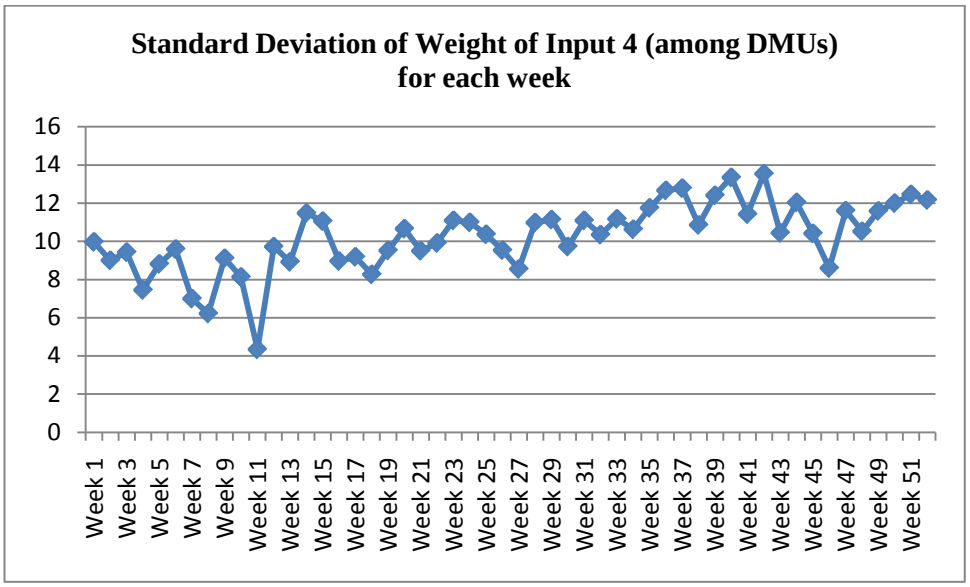

Figure 108 Standard Deviation of Weight of Input 4 (among DMUs for each week)
Input 4: Shelf Capacity

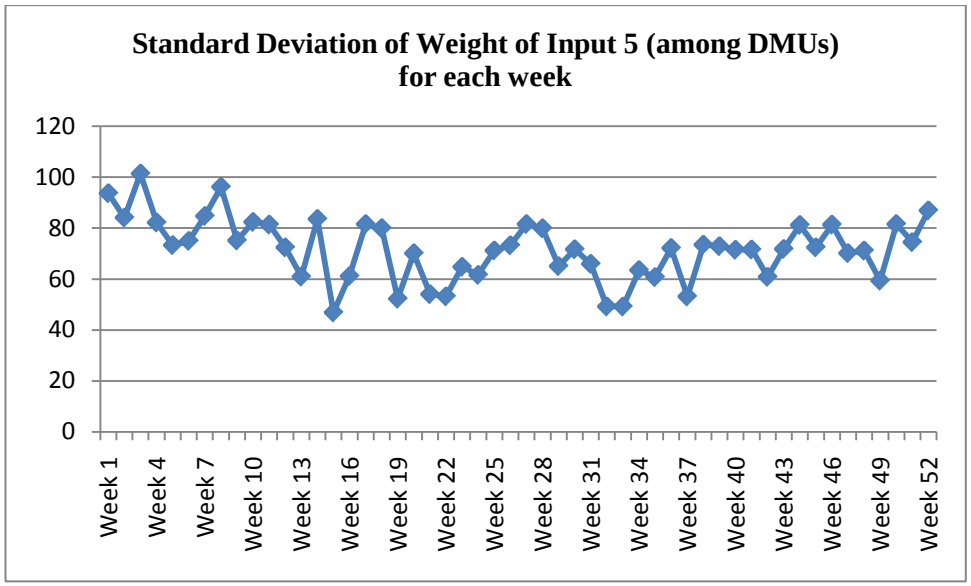

Figure 109 Standard Deviation of Weight of Input 5 (among DMUs for each week)
Input 5: Delivery frequency

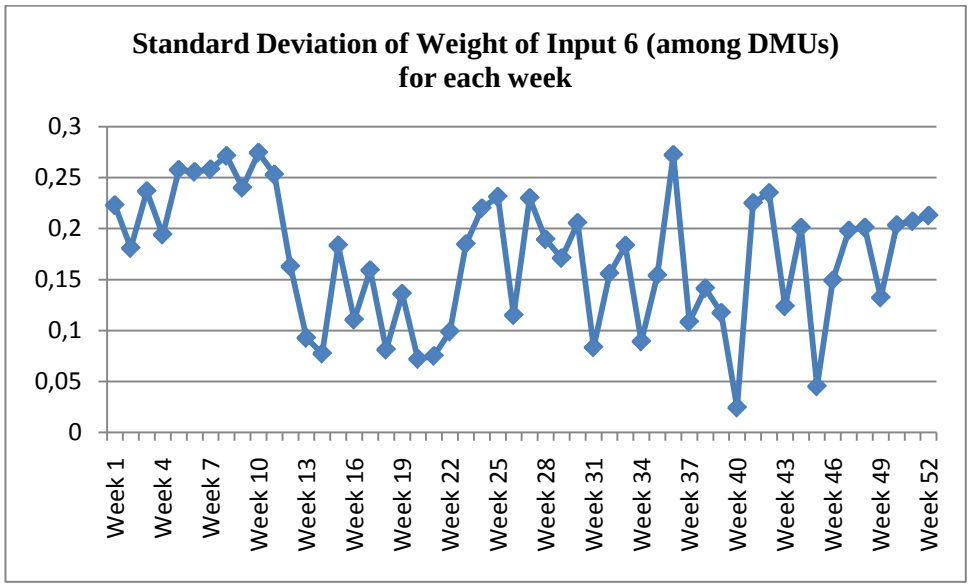

Figure 110 Standard Deviation of Weight of Input 6 (among DMUs for each week)
Input 6: Number of gaps

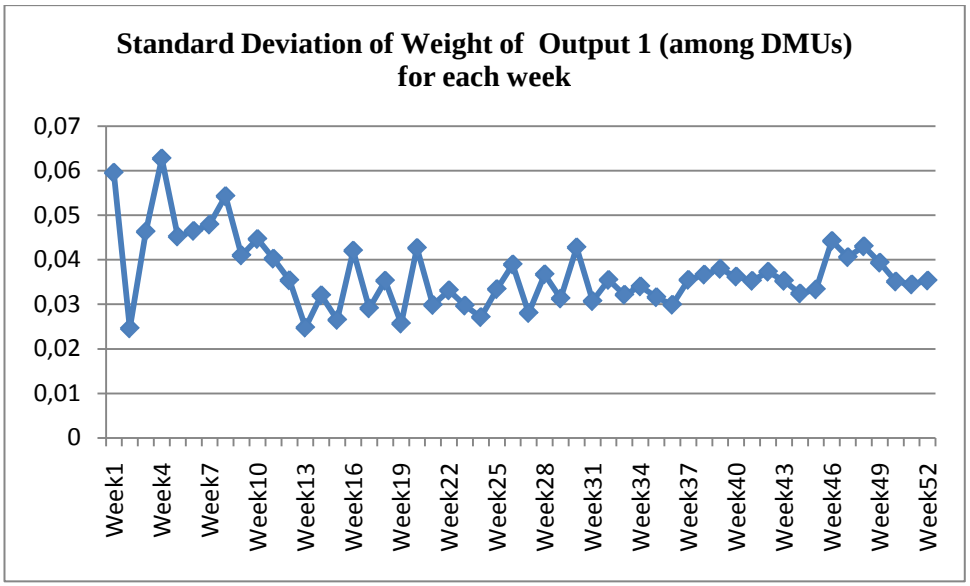

Figure 111 Standard Deviation of Weight of Output 1 (among DMUs for each week)
Output 1: Number of SKUS Sold

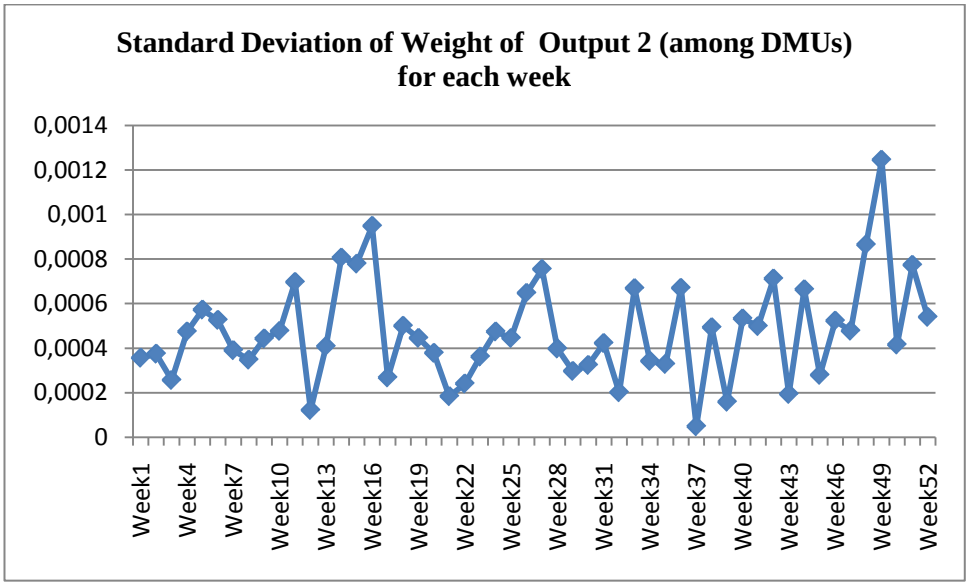

Figure 112 Standard Deviation of Weight of Output 2 (among DMUs for each week)
Output 2: Number of Units Sold

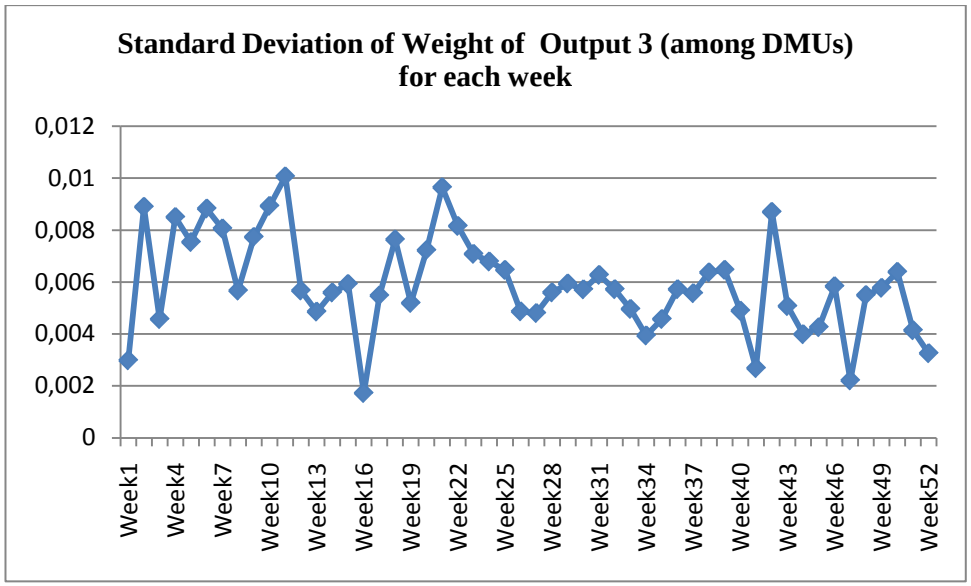

Figure 113 Standard Deviation of Weight of Output 3 (among DMUs for each week)
Output 3: Number of customers

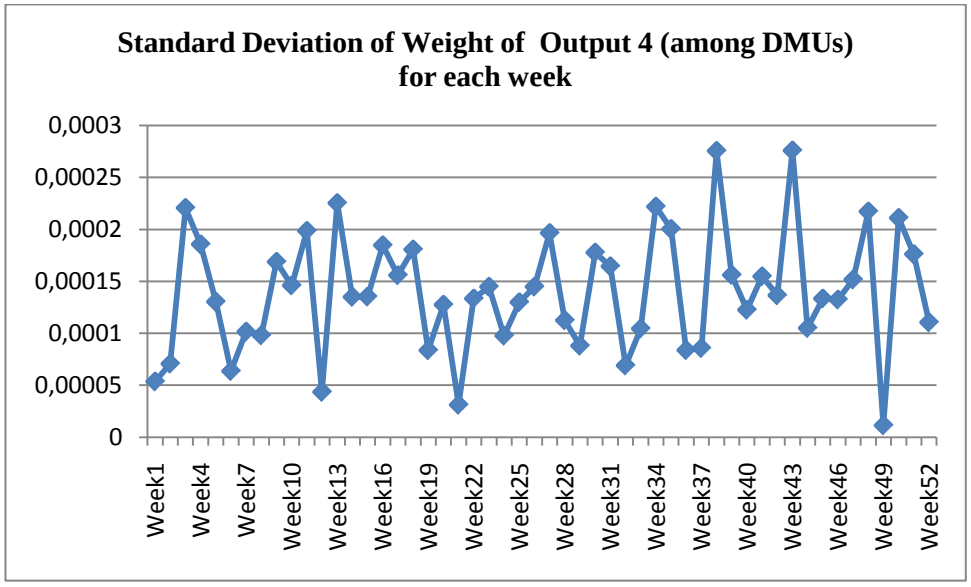

Figure 114 Standard Deviation of Weight of Input 6 (among DMUs for each week)
Output 4: Sales

APPENDIX 6

UNIT DECREASE/INCREASE IN RETAIL STORES IN WEEK OPERATING AT LOWEST EFFICIENCY SCORE

Table 50 Reducible Inputs and Increasable Outputs of DMU 3 in Week 22

DMU 3, Week 22	Decrease (in units)		Increase (in units)
Input 1	903.373	Output 1	None
Input 2	0.99085	Output 2	70,342.92
Input 3	5.76816	Output 3	1,953.803
Input 4	2.923869	Output 4	311,436.9
Input 5	0.247712		
Input 6	301.0761		

Table 51 Reducible Inputs and Increasable Outputs of DMU 5 in Week 32

DMU 5/ Week 32	Decrease (in units)		Increase (in units)
Input 1	5,470.389	Output 1	None
Input 2	1.499079	Output 2	55,216.44
Input 3	22.41258	Output 3	5,055.223
Input 4	2.044199	Output 4	33,574.83
Input 5	0.3407		
Input 6	868.4534		

Table 52 Reducible Inputs and Increasable Outputs of DMU 6 in Week 1

DMU 6 / Week 1	Decrease (in units)		Increase (in units)
Input 1	1,221.6325	Output 1	None
Input 2	1.582562	Output 2	45,976.39
Input 3	7.5435	Output 3	5,338.558
Input 4	1.688066	Output 4	210,922.8
Input 5	0.31651		
Input 6	233.65987		

Table 53 Reducible Inputs and Increasable Outputs of DMU 7 in Week 32

DMU 7/ Week 32	Decrease (in units)		Increase (in units)
Input 1	8,975.565	Output 1	None
Input 2	8.312751	Output 2	54,845.78
Input 3	21.63214	Output 3	None
Input 4	4.761791	Output 4	None
Input 5	0.816307		
Input 6	437.9049		

Table 54 Reducible Inputs and Increasable Outputs of DMU 8 in Week 48

DMU 8/ Week 48	Decrease (in units)		Increase (in units)
Input 1	2,338.923	Output 1	None
Input 2	2.178565	Output 2	32,999.62
Input 3	13.67757	Output 3	4,273.876
Input 4	3.115829	Output 4	172,253.1
Input 5	0.466835		
Input 6	823.3103		

Table 55 Reducible Inputs and Increasable Outputs of DMU 9 in Week 46

DMU 9 / Week 46	Decrease (in units)		Increase (in units)
Input 1	3,429.291	Output 1	None
Input 2	1.762572	Output 2	17,372.46
Input 3	7.129431	Output 3	2,406.805
Input 4	0.920857	Output 4	33,536.01
Input 5	2.920857		
Input 6	577.7486		

Table 56 Reducible Inputs and Increasable Outputs of DMU 10 in Week 1

DMU 10/ Week 1	Decrease (in units)		Increase (in units)
Input 1	1,948.3268	Output 1	None
Input 2	1.65430	Output 2	28,364.62
Input 3	21.880	Output 3	1,152.353
Input 4	1.890629	Output 4	123,616
Input 5	1.61965		
Input 6	114.1467		

Table 57 Reducible Inputs and Increasable Outputs of DMU 11 in Week 39

DMU 11/ Week 39	Decrease (in units)		Increase (in units)
Input 1	7,280.393	Output 1	16.15169
Input 2	21.54626	Output 2	23,806.75
Input 3	11.8755	Output 3	None
Input 4	2.687156	Output 4	313,853.1
Input 5	1.09514		
Input 6	121.2688		

Table 58 Reducible Inputs and Increasable Outputs of DMU 12 in Week 48

DMU 12/ Week 48	Decrease (in units)		Increase (in units)
Input 1	2,755.135	Output 1	None
Input 2	9.238641	Output 2	10,833.63
Input 3	14.7328	Output 3	6,506.203
Input 4	3.195079	Output 4	57,896.48
Input 5	0.44376		
Input 6	1,252.947		

Table 59 Reducible Inputs and Increasable Outputs of DMU 13 in Week 17

DMU 13/ Week 17	Decrease (in units)		Increase (in units)
Input 1	4,477.498	Output 1	None
Input 2	3.811872	Output 2	34,035.11
Input 3	13.3221	Output 3	4,149.751
Input 4	4.918485	Output 4	14,9058.8
Input 5	0.62840		
Input 6	252.7433		

Table 60 Reducible Inputs and Increasable Outputs of DMU 14 in Week 23

DMU 14/ Week 23	Decrease (in units)		Increase (in units)
Input 1	1,801.623	Output 1	None
Input 2	1.631105	Output 2	33,585.46
Input 3	8.01959	Output 3	None
Input 4	4.502399	Output 4	136,545.9
Input 5	0.33981		
Input 6	747.1576		

Table 61 Reducible Inputs and Increasable Outputs of DMU 15 in Week 25

DMU 15 / Week 25	Decrease (in units)		Increase (in units)
Input 1	411.649	Output 1	None
Input 2	1.314181	Output 2	14,658.17
Input 3	1.33340	Output 3	1,296.051
Input 4	0.428594	Output 4	56,951.41
Input 5	0.70629		
Input 6	20.57253		

Table 62 Reducible Inputs and Increasable Outputs of DMU 17 in Week 1

DMU 17/ Week 1	Decrease (in units)		Increase (in units)
Input 1	807.51068	Output 1	None
Input 2	4.830718	Output 2	5,998.064
Input 3	3.828310	Output 3	None
Input 4	1.201038	Output 4	18,869.68
Input 5	0.181766		
Input 6	12.05458		

Table 63 Reducible Inputs and Increasable Outputs of DMU 19 in Week 22

DMU 19 / Week 22	Decrease (in units)		Increase (in units)
Input 1	3,362.651	Output 1	None
Input 2	3.695728	Output 2	86,967.23
Input 3	16.97725	Output 3	1,825.785
Input 4	4.042203	Output 4	262,448.5
Input 5	0.692949		
Input 6	391.0691		

Table 64 Reducible Inputs and Increasable Outputs of DMU 20 in Week 48

DMU 20 / Week 48	Decrease (in units)		Increase (in units)
Input 1	4,501.126	Output 1	23.62963
Input 2	9.49786	Output 2	18,893.02
Input 3	22.69831	Output 3	None
Input 4	7.66151	Output 4	48,373.21
Input 5	0.889586		
Input 6	232.004		

Table 65 Reducible Inputs and Increasable Outputs of DMU 22 in Week 5

DMU 22 / Week 5	Decrease (in units)		Increase (in units)
Input 1	2,002.803	Output 1	None
Input 2	2.178989	Output 2	17,959.22
Input 3	9.416347	Output 3	3,356.828
Input 4	2.568095	Output 4	100,038.2
Input 5	1.805383		
Input 6	170.2476		

Table 66 Reducible Inputs and Increasable Outputs of DMU 23 in Week 1

DMU 23/ Week 1	Decrease (in units)		Increase (in units)
Input 1	594.9629	Output 1	None
Input 2	7.477608	Output 2	2399.98
Input 3	13.83769	Output 3	528.7609
Input 4	0,84054	Output 4	3,842.607
Input 5	0.173906		
Input 6	95.82655		

Table 67 Reducible Inputs and Increasable Outputs of DMU 26 in Week 44

DMU 26 / Week 44	Decrease (in units)		Increase (in units)
Input 1	None	Output 1	None
Input 2	None	Output 2	62,158.11
Input 3	1.18553	Output 3	1,149.848
Input 4	0.953906	Output 4	180,300.71
Input 5	None		
Input 6	82.92607		

Table 68 Reducible Inputs and Increasable Outputs of DMU 27 in Week 44

DMU 27/ Week 44	Decrease (in units)		Increase (in units)
Input 1	2,577.553	Output 1	623.5921
Input 2	7.552632	Output 2	117,987.6711
Input 3	None	Output 3	2,014.5789
Input 4	7.342105	Output 4	336,955.8289
Input 5	None		
Input 6	1,789.395		

Table 69 Reducible Inputs and Increasable Outputs of DMU 28 in Week 15

DMU 28 / Week 15	Decrease (in units)		Increase (in units)
Input 1	3,419.904	Output 1	564.2678
Input 2	4.207466	Output 2	14,247.56
Input 3	15.08409	Output 3	None
Input 4	4.611594	Output 4	96,116.37
Input 5	0.678176		
Input 6	336.0352		

Table 70 Reducible Inputs and Increasable Outputs of DMU 29 in Week 22

DMU 29 / Week 22	Decrease (in units)		Increase (in units)
Input 1	4,276.447	Output 1	560.2061
Input 2	6.221568	Output 2	29,803.19
Input 3	27.7925	Output 3	616.1234
Input 4	5.459567	Output 4	98,916.96
Input 5	0.963453		
Input 6	391.9648		

Table 71 Reducible Inputs and Increasable Outputs of DMU 30 in Week 23

DMU 30 / Week 23	Decrease (in units)		Increase (in units)
Input 1	2,422.562	Output 1	None
Input 2	10.67872	Output 2	44,499.82
Input 3	17.62879	Output 3	None
Input 4	3.141765	Output 4	245,540.4
Input 5	1.035158		
Input 6	235.9814		

Table 72 Reducible Inputs and Increasable Outputs of DMU 32 in Week 25

DMU 32 / Week 25	Decrease (in units)		Increase (in units)
Input 1	None	Output 1	1,629.7
Input 2	2.260124	Output 2	79,143.32
Input 3	None	Output 3	7,317.805
Input 4	2.646891	Output 4	277,935.2
Input 5	None		
Input 6	359.6101		

REFERENCES

Aaker, D. A. (1989). Managing assets and skills: The key to a sustainable competitive advantage. California Management Review, 31(2), pp. 91-106

Abraham, S. O. Y. and Angelo C. F. (2001). Performance of Brazilian supermarkets: a comparative analysis between large and small store chains. *Journal of Small Business and Enterprise Development*, 8 (4), pp.339 – 348.

Ailawadi K. L. (2001). The retail power-performance conundrum: What have we learned?. *Journal of Retailing*. 77(3), pp. 299-318.

Allen, R., Atnassopoulos, A., Dyson, R.G. and Thanassoulis, E. (1997). Weights restrictions and value judgements in data envelopment analysis: evolution, development and future directions. *Annals of Operations Research*. Vol. 73, pp.13-34.

Allison, G. T. (1971). Essence of Decision, Little Brown,Boston, Mass.

Amit, R. and Schoemaker, P. J. H. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, 14, pp. 33-46.

Anderson, J. L., Jolly L. D. and Fairhurst A. E.. (2007). Customer relationship management in retailing: A content analysis of retail trade journals. *Journal of Retailing and Consumer Services*. 14 (6), pp. 394-399.

Anthanassopoulos, A. (1995). Performance-improvement decision aid systems (PIDAS) in retailing organizations using data envelopment analysis. *The Journal of Productivity Analysis*, No.6, pp.153-170.

Athanassopoulos, A. and Ballantine, J. (1995) Ratio and frontier analysis for assessing corporate performance : Evidence from the grocery industry in the UK. *Journal of the Operational Research Society*, 46(4), pp. 427-440.

Arasta (1999). Alışveriş Merkezleri ve Kentleşme.

Axelrod, R. (1984). An evolutionary approach to norms. The American Political Science Review, 80(4), pp. 1095-1111.

Ayers, J. B. and Odegaard, M. A. (2007). Retail supply chain management Publications, Business & Economics.

Banker, R.D., Charnes, A., Cooper, W.W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science.* 30(9), pp.1078

Barney J. B and Mackey T. B. (2005). Testing resource-based theory. In Research Methodology in Strategy and Management. Vol. 2, Ketchen DJ, Bergh DD (eds). Elsevier: New York; 1-13.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*. 17, pp. 99-120.

Barney, J. B. (1997). Gaining and sustaining competitive advantages. Reading, MA: Addison-Wesley.

Baron S., Davies B. and Swindley, D. (1991). Dictionary of Retailing. London, UK: Macmillan

Barratt, M. And Oke, A. (2007). Antecedents of supply chain visibility in retail supply chains: A resource-based theory perspective. *Journal of Operations Management, Supply Chain Management in a Sustainable Environment; Special Issue on Frontiers of Empirical Supply Chain Research,* 25 (6), pp. 1217-1233.

Barros C.P. (2005). Efficiency in hypermarket retailing: a stochastic frontier model. *International Review of Retail Distribution and Consumer Research*. 15(2), pp. 171-189.

Barros, C. P. (2006). Efficiency measurement among hypermarkets and supermarkets and the identification of the efficiency drivers: A case study. *International Journal of Retail Distribution Management*. 34 (2), pp.135 – 154.

Barros, C.P. and Alves, C.A. (2004). An empirical analysis of growth in a Portuguese retail chain using malmquist productivity index. *Journal of Retailing and Consumer Services*. 11(5), pp. 269-278.

Barros, C.P. and Alves C.A. (2003). Hypermarket retail store efficiency in Portugal. *International Journal of Retail & Distribution Management*. 31(11), pp. 549-560.

Barros, C. P. and Perrigot, R. (2008). Technical efficiency of French retailers. *Journal of Retailing and Consumer Services,* 15(4), pp.296-305.

Bennett, P.D. (1995). Dictionary of Marketing News (2nd ed.). Chicago, IL: American Marketing Association.

Berman, B. and Evans, J.R. (2001). Retail management (8th ed.), Upper Saddle River, NJ: Prentice Hall

Berry, D., Towill, D.R. and Wadsley, N., (1994). Supply chain management in the electronics product industry. *International Journal of Physical Distribution & Logistics Management*. 24 (10), pp. 20-32.

Boussofiane A., Dyson, R. G. and Thanassoulis, E. (1991). Applied data envelopment analysis. *European Journal of Operational Research*.52(1).pp. 1-15.

Brush, C.G. and Chaganti,R. (1998), Business without glamour? an analysis of resources on performance by size and age in small service and retail firms. *Journal of Business Venturing*. 14(3), pp. 223-258.

Burstiner, I. (1991), Basic Retailing (2nd ed.), Homewood, IL: Ir Tokman win

Cachon, G.P. and Fisher, M. (2000). Supply chain inventory management and the value of shared information. *Management Science*. 46(8). pp. 1032-1048.

Caruth, D.L. and Stovall, S.A. (1994). American Business Terms Dictionary, Lincolnwood, IL: National Textbook Company

Casu, B. and Molyneux, P. (2003). A comparative study of efficiency in European banking, *Applied Economics*, Vol. 35, pp.1865-1876.

Cengiz E. and Özden B., (2003). Perakendecilikte büyük alışveriş merkezleri ve tüketicilerin büyük alış veriş merkezleri ile ilgili tutumlarını tespit etmeye yönelik bir araştırma, *Ege Akademik Bakış*, Ege Üniversitesi İktisadi İdari Siyasi Bilimler Dergisi, Sayı: 3. http://eab.ege.edu.tr/pdf/2_1/C2-S1-M6.pdf , 11.02.2011.

Charnes, A., Cooper, W.W. and Rhodes, E. (1978). Measuring the efficiency of decision-making units. *European Journal of Operational Research*, Vol.2, pp.429-444.

Charnes, A., Cooper, W.W. and Lewin, A.Y. (1996). Data envelopment analysis-theory, methodology, applications. Kluwer Academic Publishers

Child, J. (1972). Organizational structure, environment and performance: The role of strategic choice. *Sage Social Science Collections*, pp. 1-22.

Christopher, M. (1992). Logistics: The Strategic Issues, Chapman and Hall, London.

Collis, D. J. and Montgomery, C. A. (1995). Competing on resources: strategy in the 1990s. *Harvard Business Review*, pp 118-128.

Combs, J. G. and Ketchen, D. J. (1999). Explaining interfirm cooperation and performance: Toward a reconciliation of predictions from the resource-based view and organizational economics. *Strategic Management Journal*, 20, pp. 867-888.

Coff, R.W. (1999). When competitive advantage doesn't lead to performance:The resource based view and stakeholder bargaining power. *Organization Science*, 10(2), pp. 119-133.

Cook, W.D. and Seiford, L.M. (2009). Data envelopment analysis-thirty years on, *European Journal of Operational Research*. 192(1), pp. 1-17

Cooper, W., Seiford, M., Tone, K. (2000). Data envelopment analysis, Kluwer Academic Publishers, pp. 21-34

Cox, R. and Brittain, P. (2004). Retailing: an introduction, 5th edition, Pearson, UK

Corsten, D. and Gruen, T. (2003). Desperately seeking shelf availability: An examination of the extent, the causes, and the efforts to address retail out-of-stocks. *International Journal of Retail & Distribution Management*, 31(12), pp.605-617.

Cronin, J. J. (1985). Determinants of retail profit performance: a consideration of retail marketing strategies. *Academy of Marketing Science Journal*. 13(4), pp.40-53

Cross, W. (1995). Encyclopedic Dictionary of Business Terms, Englewood Cliffs, NJ: Prentice Hall

Croom, S. , Romano, P. and Giannakis, M. (2000). Supply chain management: An analytical framework for critical literature review. *European Journal of Purchasing & Supply Management*, 6 (1), pp. 67-83.

Cummins, J. and Rubio-Misas, M. (2006). Deregulation, consolidation, and efficiency: evidence from the Spanish insurance industry. *Journal of Money, Credit, and Banking*. Vol.38, pp. 323-355.

Cuthbertson, R. and Piotrowicz, W. (2008). Supply chain best practices-Identification and categorization of measures and benefits. *International Journal of Productivity and Performance Management*, 57(5), pp. 389-404

Donthu, N. and Yoo, B. (1998). Retail productivity assessment using data envelopment analysis. *Journal of Retailing*. 74(1), pp.89-105.

Dopuch, N., Gupta, M., Simunic, D. and Steain, M. (2003). Production efficiency and the pricing of audit services. Contemporary Accounting Research. Vol.20, pp.47-77.

Dreesmann, A.C.R. (1968). Patterns of Evolution in Retailing. *Journal of Retailing*. 44(1), pp. 64-81.

Dunne, P. and Lusch, R.F. (1999), Retailing (3rd ed.), Fort Worth, TX: The Dryden Press

Dyson R. G., Allen, R. Camanhob, Podinovskia, A. S.,. Sarricoa, V. V. C. S and Shalea, E. A. (2001). Pitfalls and protocols in DEA. *European Journal of Operational Research*, 132(2). pp. 245-259.

Eisenhardt K. M. (1989). Agency theory: an assessment and review. *The Academy of Management Review*, 14(1), pp.57-74.

Ellinger, A.E. (2000). Improving marketing/logistics cross functional collaboration in the supply chain. *Industrial Marketing Management*. Vol.29, pp. 85-96

Ellram, L.M. (1991). Supply chain management: the industrial organisation perspective. *International Journal of Physical Distribution & Logistics Management.* 21(1). pp.13 – 22.

Farrell, M.J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society*, 120(3). pp. 253-290.

Fawcett, S.E., Magnan, G.M. and McCarter, M.W. (2008). Benefits, barriers, and bridges to effective supply chain management. *Supply Chain Management: An International Journal*, 13(1), pp.35-48.

Flegg, A., Allen, D., Field, K. and Thurlow, T. (2004). Measuring the efficiency of British universities: A multi-period data envelopment analysis. *Education Economics*, Vol.12, pp.231-249

Gaur V., Fisher M. L. and Raman A. (2005). An econometric analysis of inventory turnover performance in retail services. *Management Science*. 51(2), pp. 181-194.

Gaur V., Giloni A., and Seshadri S. (2005). Information sharing in a supply chain under ARMA demand. Management Science. 51(6), pp. 961-969.

Gary H., and Prahalad. C. K. (1990). The core competence of the corporation. *Harvard Business Review*. 68(3), pp. 79-91.

Giannakis, M., and Croom S. R. (2004). Toward the development of a supply chain management paradigm: A conceptual framework. *Journal of Supply Chain Management*. 40 (2). pp. 27-37

Gimenez, C. and Ventura, E. (2005). Logistics-production, logistics-marketing and external integration. *International Journal of Operations&Production Management*. 25(1), pp. 20-38.

Goldratt, E. M., (1990). What is thing called theory of constraints and how should it be implemented?. Croton-on-Hudson, N.Y.

Gong, B. and Sickles, R. (1992). Finite sample evidence on the performance of stochastic frontiers and data envelopment analysis using panel data. *Journal of Econometrics*. 51 (1-2), pp.259-284.

Grover V. and Malhotra M. K. (2003). Transaction cost framework in operations and supply chain management research: theory and measurement. *Journal of Operations Management*. 21 (4). pp. 457-473.

Gunasekaran, A., Patel, C. and Tirtiroglu, E. (2001). Performance measures and metrics in supply chain environment. *International Journal of Operations & Production Management*. 21(1/2), pp.71-87.

Gunay N. (2009). Perakende sektörü için yenilikçi bir performans ölçüm metodu, Proje no: 107K557, TÜBİTAK Araştırma Destek Programları Başkanlığı, İzmir

Harland, C., Brenchley R., and Walker H. (2003). Risk in supply networks. Journal of *Purchasing and Supply Management*. 9(2).pp. 51-62.

Hart, S. L. 1995. A natural-resource-based view of the firm. *Academy of Management Review*. 20. pp. 986-1014.

Helfat, E. and Peteraf M. A. (2003). The dynamic resource-based view: capability lifecycles. *Strategic Management Journal*. 24 (10), pp. 997-1010.

Hjalmarsson, L. and Veiderpass, A. (1992). Productivity in swedish electricity retail distribution. *Journal of Economics,* pp.193-205.

Hughes, P. and Edwards, M. (2000). Leviathan vs. liliputian: a data envelopment analysis of government efficiency. *Journal of Regional Science*. Vol.40, pp.649-669.

Hunt, S. D. and Davis D. F. (2008). Grounding supply chain management in resource-advantage theory. *Journal of Supply Chain Management*. 44(1), pp. 10-21

Jacobs, R. (2001). Alternative methods to examine hospital efficiency: Data envelopment analysis and stochastic frontier analysis. *Health Care Management Science,* 4 (2), pp.103-115.

James, D.L., Walker, B.J. and Etzel, M.J. (1981). Retailing today (2nd ed.), New York: Harcourt Brace Jovanovich.

Jones, P., Hillier, D., Comfort, D. and Eastwood, I. (2005). Sustainable retailing and consumerism. *Management Research News*, 28(1), pp.34-44.

Jorge D. J., (2008).Efficiency and regulation in Spanish hypermarket retail trade. International *Journal of Retail & Distribution Management*. 36(1). pp. 71-88

Jun, M. and Cai S.(2001). The key determinants of internet banking service quality: a content analysis. *International Journal of Bank Marketing*. 19(7). pp.276 – 291

Jüttner, U., Christopher, M. and Godsell, J. (2010). A strategic framewok for integrating marketing and supply chain strategies. *The International Journal of Logistics Management*. 21(1), pp. 104-126

Kamanli, E. (2004), Evaluation of the operational effectiveness of retail stores Using statistical regression and data envelopment analysis. Master of Science in Industrial Engineering Thesis, Boğaziçi University.

Kamakura,W., Lenartowicz, T. and Ratchford,B. (1996). Productivity assessment of multiple retail outlets. Journal of Retailing, 72 (4), pp. 325-330.

Kazancoglu,Y. (2008). Lojistik yönetimi sürecinde tedarikçi seçimi ve performans değerlendirilmesinin yöneylem araştirmasi teknikleri ile gerçekleştirilmesi: ahp (analitik hiyerarşik süreç) ve dea (veri zarflama analizi), Ege University, Unpublished PhD Thesis, Izmir.

Keh, H.T. and Chu, S. (2003). Retail productivity and scale economies at the firm level: a dea approach, *Omega*. 31(2), pp. 75-82.

Ketchen, D. J., Hult G. T. M. and Slater, S. F. (2007). Toward greater understanding of market orientation and the resource-based view. *Strategic Management Journal*, Volume 28, Issue 9, pages 961–964

Ketchen D. J. and Hult, G. T. M. (2007). Bridging organization theory and supply chain management: The case of best value supply chains. *Journal of Operations Management*, 25(2), pp. 573-580.

Kopczak, L. R. (1997). Logistics partnerships and supply chain restructuring: Survey results from the U.S. computer industry. *Productions and Operation Management*, 6(3), pp. 226-247.

Kotler, P. and Armstrong, G. (2007). Principles of Marketing, 12th ed., Prentice Hall, New Jersey, NJ.

Krasachat, W. (2004). Technical efficiencies of rice in Thailand: a non-parametric approach. *Journal of American Academy of Business*. Vol. 4, pp.64-69.

Krippendorff, K. (1980). Content analysis: an introduction to its methodology. Beverly Hills, CA: Sage

Kumcu, E. and Kumcu, M.E. (1987). Determinants of food retailing in developing economies: the case of Turkey. *Journal of Macromarketing*, Vol. 7,pp. 26-40

Lambert, D.M and Pohlen, T.L. (2001). Supply chain metrics. *The International Journal of Logistics Management*. 12(1), pp. 1-19

Lambert, D.M. (2008). Supply chain management- processes, partnerships, performance. Third Edition, Supply Chain Management Institute, U.S.A.

Larsen, T. S., (1999). Supply chain management: a new challenge for researchers and managers in logistics. *International Journal of Logistics Management*. 10(2), pp.41-54.

Levy, M. & Weitz, B.A. (1996), Essentials of Retailing, Boston, MA: Irwin McGraw-Hill.

Lucas, G.H., Bush, R.P. Jr., and Gresham, L.G. (1994). Retailing, Boston, MA: Houghton Mifflin.

Lynch, J. and Whicker, L. (2007). Do logistics and marketing understand each other? an empirical investigation of the interface activities between logistics and marketing. *International Journal of Logistics Research and Applications*. 11(3), pp.167-178.

Mahoney, J.T. (1995). The management of resources and the resource of management. *Journal of Business Research,* 33(2), pp. 91-101.

Markides C. C. and Williamson P. J. (1996). Corporate diversification and organizational structure: a resource-based view. *The Academy of Management Journal*. 39(2), pp. 340-367.

Martin, J. and Grbac, B. (2003). Using supply chain management to leverage a firm's market orientation. *Industrial Marketing Management*, 32(1), pp.25-38

Mason, J.B., Mayer, M.L. and Ezell, H.F. (1991). Retailing (4th ed.), Homewood, IL: Irwin

Mattila H., King, R. and Ojala, N. (2002).Retail performance measures for seasonal fashion. *Journal of Fashion Marketing and Management*, 6 (4), pp.340 – 351.

Morash, E. A. And Lynch, D.F. (2002). Public policy and global supply chain capabilities and performance: A resource-based view. *Journal of International Marketing*, 10(1), pp. 25-51.

Mishra R. K. (2009). Benchmarking scheme for retail stores efficiency. *International Journal of Marketing Studies*, 1(2) pp. 131- 150.

Morgenstein, M. and Strongin, H. (1983). Modern retailing: principles and practices, New York: John Wiley & Sons

Mulhern, F.J. (1997). Retail marketing: from distribution to integration. *International Journal of Research in Marketing*. Vol.14, pp. 103-124.

Murphy, P.R and Poist, R.F. (1996). Comparative views of logistics and marketing practitioners regarding interfunctional coordination. *International Journal of Physical Distribution&Logistics Management*. 26 (8), pp.15-28.

Nahapiet, J. and Ghoshal, S. (1998). Social capital, intellectual capital and the organizational advantage. *The Academy of Management Review*, 23(2), pp. 242-266.

Newbert, S. L. (2008). Value, rareness, competitive advantage, and performance: a conceptual-level empirical investigation of the resource-based view of the firm. *Strategic Management Journal*. 29, 745-68.

Olavarrieta, S. and Ellinger, A.E. (1997) Resource-based theory and strategic logistics research. *International Journal of Physical Distribution & Logistics Management*. 27(9/10). pp.559 – 587.

O'Neill, L. (1998). Multifactor efficiency in data envelopment analysis with an application to urban hospitals. *Health Care Management Science*, 1(1), pp. 19-27.

Ozpeynirci, O. And Koksalan, M. (2007). Performance evaluation using data envelopment analysis in the presence of time lags. 27(3), pp.221-229

Pallant, J., (2007). SPSS Survival Manual:A step-by-step guide to data analysis using SPSS version 15, (3rd edition), Milton Keynes: Open University Press.

Penrose, E. (1959). The theory of the growth of the firm. Oxford University Press, New York, NY,

Peteraf, M. A. (1993). The cornerstones of competitive advantage: a resource-based view. *Strategic Management Journal*, 14, 179-191.

Peterson, R.A. and Balasubramanian, S. (2002). Retailing in the 21st century: Reflections and prologue to research. *Journal of Retailing*, 78, pp.9-16.

Pfeffer, J. and Salancik, G.R. (1978). The external control of organizations: A resource dependence perspective, New York: Harper and Row.

Porter, M.E. (1980). Competitive strategy: Techniques for analyzing industries and competitors, *Free Press*, New York.

Prahalad, C.K. and Hamel, G. (1990). The core competency of a corporation. *Harvard Business Review*, 68 (3), pp. 79-91.

Ratchford, B.T. (2003). Has the productivity of retail food stores really declined?. *Journal of Retailing*. 79(3), pp.171-182.

Ratchford, B.T. and Stoops, G.T. (1988). A model and measurement approach for studying retail productivity. *Journal of Retailing*. Vol. 64, pp.241-63.

Rosenberg, J.M. (1993). Dictionary of Business and Management, NE Work: John Wiley & Sons

Rubio, R. Sellers and Ruiz,M. F. (2006). Economic efficiency in supermarkets: evidences in Spain. *International Journal of Retail & Distribution Management*. 34 (2), pp. 155-171.

Rubio, R. Sellers and Ruiz,M. F. (2007). An empirical analysis of productivity growth in retail services: evidence from Spain. *International Journal of Service Industry Management.* 18(1), pp.52-69.

Rubio-Sellers, R. and Mas-Ruiz, F. (2007). Different approaches to the evaluation of performance in retailing. *The International Review of Retail Distribution and Consumer Research*. 17(5), pp. 503-522.

Rumelt, R. P. (1991). How much does industry matter. *Strategic Management Journal*, 12, 167-185.

Rumelt, R.P. (1984). Towards a strategic theory of the firm in Lamb, R. (Eds),Competitive Strategic Management. Prentice-Hall, Englewood Cliffs, NJ, pp.556-70.

Rungtusanatham, M. F., Forza S., C. and Choi T.Y., (2003). Supply-chain linkages and operational performance: a resource-based-view perspective. *International Journal of Operations & Production Management.* 23(9), pp.1084-1099.

Saunders, M.J., 1995. Chains, pipelines, networks and value stream: the role, nature and value of such metaphors in forming perceptions of the task of purchasing and

supply management. First Worldwide Research Symposium on Purchasing and Supply Chain Management. Tempe, Arizona, pp. 476-485.

Sherman, H. and Ladino, G. (1995). Managing Bank Productivity Using Data Envelopment Analysis, Vol.25, No.2, pp. 60-73.

Simatupang T. M., Wright A. C., and Sridharan R., (2004). Applying the theory of constraints to supply chain collaboration. *Supply Chain Management: An International Journal*. 9(1), pp.57-70.

Simatupang, T. M. and Shidharan, R. (2002). The collaborative supply chain. International *Journal of Logistics Management*. 13(1), pp:15-30.

Sparks, L. (1998). The retail logistics transformation, in Fernie, J. and Sparks, L. (Eds), Logistics and Retail Management, Kogan Page, London, pp. 1- 22.

Sparks, L. and Wagner, B.A. (2003). Retail exchanges: a research agenda. *Supply Chain Management: An International Journal*, 8(3), pp. 201-208.

Stepherd, C. and Günter H. (2006). Measuring supply chain performance: current research and future directions. *International Journal of Productivity and Performance Management*, 55(3/4), pp. 242-258.

Stone, P.J., Dunphy, D.C., Smith, M.S. and Ogilvie, D.M. (1966). The general inquirer: a computer approach to content analysis. Cambridge: MIT Press

Tan, K.C., Kannan, V.J. and Handfield, R.B., (1998). Supply chain management: supplier performance and firm performance. *International Journal of Purchasing and Materials Management.* 34(3),pp 2-9.

Tek, O.B. (1986). Retail structure and consumerism in Turkey: the question of economic development and retail technology transfer in the role of marketing in development:global, consumer and managerial issues Erdoğan Kumcu et al., eds., Muncle, IN and Istanbul: Ball State University Press and Istanbul University Press

Thomas J., and Riley D. W. (1985), Using inventory for competitive advantage through supply chain management. *International Journal of Physical Distribution and Materials Management*. 15(5), pp. 16-26.

Thomas C. Jones and Riley, D.W. (1985). Using inventory for competitive advantage through supply chain management. *International Journal of Physical Distribution & Logistics Management.* 15(5). pp.16 – 26.

Thomas, R.R., Barr, R.S., Cron, W.L. and Slocum, J.W. (1998). A process for evaluating retail store efficiency: a restricted DEA approach. *International Research in Marketing*. Vol: 15, pp. 487-503.

Tokman, M., Richey, G., Marino, L. and Weaver, M. (2007). Exploration, exploitation and satisfaction in supply chain portfolio strategy. *Journal of Business Logistics*. 28(1), pp.25-56

Van Der Vorst, J.G.A.J., Beulens, A. J. M., Wit W. De. and Van Beek V. (1998). Supply chain management in food chains: Improving performance by reducing uncertainty. *International Transactions in Operational Research*. 5(6), pp. 487-499.

Weber, R. P. (1990). Basic Content Analysis, 2nd ed. Newbury Park, CA.

Wernerfelt B. (1995). The resource-based view of the firm: ten years after. *Strategic Management Journal*. 16 (3), pp. 171–174.

Wood, D, J. and Gray B. (1991) . Collaborative alliances: moving from practice to theory. *The Journal of Applied Behavioral Science*. 27(1), 3-22.

Wu, F., Yeniyurt, S., Kim, D. and Cavusgil, S.T. (2006). The impact of information technology on supply chain capabilities and firm performance: a resource-based view. *Industrial Marketing Management*. 35(4), pp. 493-504.

Yang, Z. and Fang X.(2004). Online service quality dimensions and their relationships with satisfaction: A content analysis of customer reviews of securities brokerage services. *International Journal of Service Industry Management*. 15(3). pp.302 – 326.

Yu, A.S.O.Y. and De Angelo, C.F. (2001). Performance of Brazilian supermarkets: A comparative analysis between large and small store chains. *Journal of Small Business and Enterprise Development*, 8 (4), pp. 339-348.

http://eab.ege.edu.tr/pdf/2_1/C2-S1-M6.pdf, 03.01.2011

http://retailindustry.about.com/od/statisticsresearch/p/retailindustry.htm, 09.10.2009

http://www.pr-inside.com/new-market-study-carrefour-turkey-r2649515.htm, 24.04.2011

http://www.deloitte.com/assets/DcomGlobal/Local%20Assets/Documents/dtt_cb_hiddenheroes0410.pdf , 15.03.2011.

http://www.deloitte.com/assets/DcomGlobal/Local%20Assets/Documents/Global%20Powers%20of%20Retailing_07%283%29.pdf , 16.02.2011.

http://www.ampd.org/ , Trade Council of Shopping Centers & Retailers, 10.10.2010

IMAD Global Retail Report (2010)

http://www.imap.com/imap/media/resources/IMAPRetailReport8_23CB9AA9C6EBB.pdf , 17.03.2011.

Leaving Home Global Powers of Retailing 2011, Deloitte

http://www.deloitte.com/assets/DcomPortugal/Local%20Assets/Documents/CB/pt%28en%29_cb_gpr2011_17012011.pdf , 03.04.2011.

AMPD Perakende Endeksi by Nielsen, Temmuz 2009 Sonuçları - Organize Perakende Ciroları, http://www.dijimecmua.com/dagitim-kanali-dergisi/523/index/744572_ampd perakendeendeksi-by-nielsen-temmuz-2009-sonuclari-organize-perakende-cirolari/ , 03.03.2011.

http://download.pwc.com/ie/pubs/glimmers_amid_the_glooms.pdf , 28.03.2011.

Glimmers amid the gloom , the outlook for the retail and consumer products sector in emerging markets, PWC (2010)

Emerging from the downturn - global powers of retailing 2010, Deloitte

http://www.deloitte.com/assets/DcomGlobal/Local%20Assets/Documents/Consumer%20Business/dtt_globalpowersofretailing2010.pdf , 17.04.2011.

Deloitte hidden heroes-emerging retail markets beyond China report (2010), http://www.deloitte.com/assets/DcomGreece/Local%20Assets/Documents/Attachments/gfsi/hiddenheroes2010.pdf, 04.03.2011

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