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The development of a product pricing method and demand forecasting model for import SMEs in Vietnam – Case company X Co., Ltd.

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Abstract

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Pricing and inventory management are indisputably two of the most important issues in business management. Firms have made large investments in these areas to set appropriate prices and manage stocks efficiently. The topics deserve further investigations towards a better understanding and administration of them.

This study aims to investigate pricing and inventory management by using empirical evidence from the case company. In view of the case company data, the study realizes the existence of critical products, possibly mathematical expression between the direct costs of critical products as well as feasible estimations of critical product demands.

The study employs concurrent theories such as the 80/20 Principle, cost-plus pricing and a linear regression forecasting model with seasonal adjustments to develop the five-step pricing method and the demand forecasting model which can be widely applied by both the case company and other interested firms.

Keywords
The 80/20 Principle, the Pareto principle, cost-plus pricing method, linear regression forecasting, import, SMEs, Vietnam.

Table of contents

Lists of tables

Lists of figures

1 Introduction

The introduction presents the information that helps to develop general ideas about the thesis and its structure. The chapter begins with some facts of the commissioning company to form the scope and the context of the study such as the company history, the company business as well as the company problems. Subsequently, the thesis objectives are discussed to clarify what issues this paper attempts to tackle. The chapter ends with the thesis structure that demonstrates the study contents and its writing organization.

1.1 Case company introduction

The commissioning organization of the thesis is company X Co., Ltd. which is a small company specializing in importing some dried fruits from the partners located in China and Thailand to Vietnam. The products are produced in a numbers of countries such as Australia, China, Turkey and the United State of America (USA). The case company clients are mainly large bakeries and hotels in Vietnam. Despite its small size, company X is one of three key players in the market of dried fruits that are used to make premium cakes.

The case company was founded in 2007 and the business has developed stably since 2009. The case company has a clearly goal not to engage in the "price war" that refers to the price competition in the market. Instead, the case company concentrates on the improvement of services and the customer satisfaction. Further, the case company has built a loyal customer network and has been well known for high service quality. Accordingly, the case company has advantages to charge a higher price than other rivals.

The case company is aware of the importance of inventory management, especially in import business, which indicates an efficiency of a company in responding to the customers' needs and in communicating with the suppliers. Anticipating customer demands will help the case company to have a better control of company stocks. That leads to a need of developing a demand forecasting model. Another crucial concern of

the case company is product pricing, which is certainly the common interest of most business firms. Accordingly, the study will discuss topics in terms of pricing and forecasting practices.

1.2 Thesis objectives

Every thesis is written to achieve certain goals, which need to be set out in advance to direct the research towards expected results. Thesis objectives indicate the content, scope and purposes of a thesis, which are stated concisely in a thesis topic. Investigative questions are created to guide the thesis in terms of what actions should be done to reach the thesis purposes. The section will present both the thesis topic and the investigative questions of this paper.

1.2.1 Thesis topic

The thesis topic is formed from the research topic and the research problem. The research topic indicates fields that draw interest from the author. The research problem is the demarcation of the research topic to delimit the extent of this paper.

In a nature of things, companies face up with multiple difficulties in business. Problems may arise from different areas such as marketing, logistics, business management and competition. Nevertheless, pricing seems to be the most critical issue that confronts most of firms. In order to make a product price, the company has to master all product cost information as well as the product cost structure. Another issue the company may attempt to tackle is how to foresee the customer demands. The demand anticipation will aid the company in serving the market better. In short, the research topic includes cost management, pricing and demand forecasting in business practice.

Although the research topic narrows the areas that should be focused on this study, the issues regarding cost management, pricing planning and demand forecasting are still too broad. To make the research more specific, the researched fields are limited to the context of the case company and critical import products. The research problem is

demarcated from the research topic and presented as: "The analysis of costs and demand of critical import products to develop a product pricing method and a demand forecasting model for small and medium enterprises (SMEs) specializing in import in Vietnam"

The thesis topic is sprung from the research problem in order to make it more impressive and concise. The thesis topic is: "The development of a product pricing method and demand forecasting model for import SMEs in Vietnam – Case company X Co., Ltd.".

1.2.2 Investigative questions (IQs)

Investigative questions are created to divide the topic into smaller blocks which can be contended with more easily by answering the questions listed in each block.

Products investigation:

- IQ1: What are critical import products of the company?

Product pricing investigation:

- IQ2: What are crucial costs of each critical import product?
- IQ3: How to compute crucial costs per kilo for each product?
- IQ4: What are cost-plus pricing structures of each critical import product?
- IQ5: How to price each critical import product using cost-plus pricing method?

Product demand investigation:

- IQ6: How to estimate future sales volume in kilo of each critical import product?

The overlay matrix will show the sections each questions are handled in terms of the theory and the findings (Attachment 1).

1.3 Thesis structure

Since the study aims to attempt the above-mentioned inquires one by one, the thesis is hence structured in the order of investigative questions. The fundamentals of the thesis are provided in two initial two chapters. Specifically, chapter 1 – "Research methodology" discusses ways of conducting this research and chapter 2 – "Theories overture" clarifies hypotheses that will be employed in this study. Then, chapter 3 – "Product analysis" shows how the critical import products are identified. Chapter 4 – "Cost analysis" handles the costs of critical products to the greater extent. Afterwards, the method to construct the prices of critical products is given in chapter 5 – "Pricing method". The study continues with chapter 6 – "Demand forecasts" to develop the forecasting model for demands of critical products. Finally, chapter 7 – "Discussion" reviews the key results of the thesis as well as gives some recommendations and suggestions for further researches.

2 Research methodology

Research methodology and research method are often confused concepts and mistakenly used as interchangeable terms. Indeed, two terminologies refer to different matters. Research method is "a way of conducting and implementing research" while research methodology is defined as "the science and philosophy behind all research" (Adam, Khan, Raeside & White 2007, 25). In other words, research methods are means to conduct research such as experiments, observations, tests, surveys and the like. On the contrary, research methodology is a system of thoughts, understandings and learning constructed specifically to create a proper research. The research methodology presents not only a direction toward the logicality and veracity of research results but also a thorough understanding of researched matter. Hence, researchers comprehend how and from where the knowledge comes, which will allow them to be critical and analytical of information that is obtained during the research process (Adam et al. 2007, 25). The study, therefore, portrays a methodology concerning research types and method, data collection and analysis techniques.

2.1 Research types and methods

Every research has certain purposes such as to enhance human knowledge of cognitive matters or to augment human knowledge about perspectives of the world that are new or known little (Adam et al. 2007, 20). Depending on the research purpose, the research can be classified as descriptive, explanatory or predictive research. Descriptive research is used to illustrate phenomena but not to explain the nature why it happens. Explanatory research also describes phenomena but provides deeper knowledge since it derives the reasons why the phenomena occur. Predictive research refers to a higher research that provides not only elucidations of phenomena but also predicts future results given alterations in relevant variables of a specific phenomenon. (Adam et al. 2007, 20.)

This study follows the predictive research since the thesis aims at examining the demands and costs of critical products to develop a pricing method and a demand forecasting method for the case company. A pricing method is developed to facilitate

the case company's pricing decisions given any changes in costing structure of critical products. Likewise, a forecasting method of demand is constructed to enhance the inventory control procedure. In order to achieve these goals, the investigation of the company's historical data is extremely important. Thus, the quantitative research method is the most appropriate method to collect the company data.

2.2 Data collection

The data collection procedure is established to get data for analyses with respect to finding critical products, comprehending the cost-plus pricing structure of critical products as well as understanding demands of critical products.

The study will start with collecting sales data in monetary amount of the case company, which is used to evaluate the product performance. Although the product performance can be measured by several ways, sales data is the good indicator for evaluating how well a product is consumed. A product which accounts for higher sales revenue than the others reflects its importance such as its necessity or exclusivity. A company has to sell the product, even if it may not generate as high profit as the others. Therefore, critical products of the case company can be identified using the sales data. The question is probed here regarding the time span of the gathered data, what the period of time should be explored to find out critical products. In practice, critical products of a company are identified after sufficiently long observations, especially after the milestone when the company business becomes stable since only momentous products are kept during the business development. Therefore, the study attempts to get sales data in Vietnam Dong (VND) of the case company during three years from 2009, the year that the business went to steady condition, until the last year 2011.

After critical products are determined, cost information of them will accordingly be collected in the same time span, three years in length between 2009 and 2011. Nonetheless, a consequential thing should be done beforehand is to comprehend the product cost structure, which helps to select important costs. Additionally, the relevant quantities of products are also acquired as the study tries to find out how much the

cost base per kilo of each product is. The product selling prices are also collected for developing a pricing method.

A last issue the study attempts to answer is the case company's inventory management, particularly how to predict sales volumes in kilo of critical products, which will help to run the business more efficiently. Market demand that is interpreted as customer orders or the sales volume in kilo is the key to unlock this problem. Consequently, collecting sales volume in kilo of critical products during three years (2009–2011) is vital to formulate a demand forecasting model.

2.3 Methods of analysis

The data collection part if done is just the necessary condition as it only brings back facts that are not useful for the case company. A sufficient condition is to discover inferences of conventional facts, which are expected to provide valuable understandings to enable the case company to solve its issues. Knowledge about methods of analysis is what needed to mine precious information from abundant trivial data. There are a number of methods available in practice, nonetheless within the context of this study only several methods are discussed. They are intentionally selected to crack investigative questions.

Product sales data in Vietnam Dong (VND) will be at first addressed to find critical products. The analysis method known as the 80/20 Analysis is employed to tackle the question how pivotal products are recognized and selected. The analysis applicability is argued based on the 80/20 Principle. Afterwards, a cost analysis of critical products is made to construct both a cost structure and a cost-plus pricing method for critical products. Finally, sales volume data of critical products are analyzed by regression analysis to build up a demand forecasting model. All expectably used methods are reasoned based on contemporary theories that are presented in the next chapter.

3 Theories overture

This chapter outlines theories and tools that are used as supports for data analysis process. The 80/20 principle is firstly introduced to give ideas about a principle of imbalance and how to use it to explore a relationship between causes and effects. Afterwards, pricing decisions are discussed with emphases on cost analysis and cost-plus pricing method. Finally, several concepts of forecasting as well as a selected forecasting method are mentioned to introduce the forecasting theory and its practical usage.

3.1 The 80/20 Principle exordium

The universe is unbalanced, which means in any population there are always some things that are much more important than the others. For example, political power of a country of millions of people usually belongs to a group of hundreds of persons; the world economy depending on just ten economies or among numerous hurricanes taken place in the world, there are only some having most significant influence to human life. Knowing which things are more critical than others is very important for a decision-making process. For instance, a company will probably concentrate to serve the key customers segment among plentiful ordinary ones rather than spreading its resources equally for all segments. The key customers bring more benefits than the others and pleasing them will return higher profits or maintain the competitive advantages. Thus, the challenge is how to identify and select the pivotal objects from multiple things having similar property or being homogeneous in certain context. The 80/20 Principle and its implementation – the 80/20 Analysis are perhaps the solutions for the query.

3.1.1 The 80/20 Principle

In nineteen century, an Italian economist namely Vilfredo Pareto (1848–1923), by analyzing the pattern of wealth and income in England at his time, came to a discovery that 80 percent of the national wealth belonged to 20 percent of people in his sample ("the vital few"). This finding may be seen conventional but it contained two

important matters. The first one implied that there is always predictable imbalance of resources distribution. The other was more interesting to Pareto when he realized that there was a consistent pattern of imbalance in data from different time periods or from different countries. (Koch 1998, 6–7.)

There is the main tenet that is extrapolated from the principle, which is an asymmetric relationship between causes and effects, between inputs and outputs and between efforts and rewards. When measuring the relationship, a good benchmark for the imbalance is 80/20 pattern, which is commonly seen in practice, 80 percent of effects, outputs or rewards are sprung from only about 20 percent of causes, inputs or efforts. The relationship may not be exact 80/20 but 80/30, 60/35 or 90/5. However, all figures contain a core meaning – an unbalanced pattern of resources distribution. Therefore, to emphasize the importance of this idea, the principle will be used in this study as The 80/20 Principle although Pareto's work is known with many names such as the Pareto Principle, the Pareto Law, the 80/20 Rule, the Principle of Least Effort and the Principle of Imbalance.

The 80/20 Principle brings new insight to human knowledge. People tend to think that all causes having roughly same significance. According to this wisdom, the more causes are added, the more effects can be obtained as a consequence. However, the realities may show a different outcome. To simplify, an example about a restaurant business will be considered. Hypothetically, the restaurant serves two kinds of food sections – 20 cheap dishes cost only €2 each and five expensive dishes with the price of €10 each. A restaurant owner wanted to improve profits of the business and accordingly he advertised intensively to increase the overall sales of food menu items. The profit of this quarter indeed increased compared with previous one but was lower than what expected. So, what was the problem? The owner did further research and investigated that the sale volume of food items increased monthly 500 items, of which 75 percent (375 items) is from cheap dishes and 25 percent (125 items) from expensive dishes. The issue was exposed to show a wrong focus of business strategy. Although the volume sale of cheap dishes was three times more than that of expensive dishes every month, the sale in euro from cheap dishes (€700) was 0.56 times less than the amount

of expensive dishes (€1250). The practice implied that the profit made from expensive dishes was higher than from cheap ones. The reason is simply the price of expensive product is five times higher than cheap products, which makes five cheap products sold equals just one expensive product sold. Rather than stimulating customers to order more expensive items, which contributes to higher profit margin, the restaurant treated two kinds of products equally and made inappropriate decision to concentrate on boosting the volume sales in general. Consequently, the profit was not maximized fully.

The 80/20 Principle clearly proved its power from the above-mentioned illustration. There is the distinctly unbalanced significance of causes (products) and effects (profit contributions). The profit contribution from vital few products – only five items is much higher than the trivial many – 20 items. There is the imbalance between causes and effects and they are rarely linked in an equal way. The most important thing is, thus to view all inputs, causes or efforts with different attentions and to identify the momentous items that can substantially impact outputs, results or rewards. Knowing that will help people not only to allocate available resources to make best use of the vital few but also to enhance the trivial many for a better performance.

3.1.2 The 80/20 Analysis

There are two ways of using the 80/20 Principle namely the 80/20 Analysis and the 80/20 Thinking (Koch 1998, 29). In this paper, only the 80/20 Analysis is presented due to its appropriateness to the study context. The analysis will examine the relationship between two comparable data sets that can be turned into percentages, for instance, a data contains a number of objects and another data consists of objects' interesting characteristics. Then, the data relates to objects' property is arranged in descending order, which will sort the other data accordingly. The procedure of the 80/20 analysis is visualized in Figure 1.

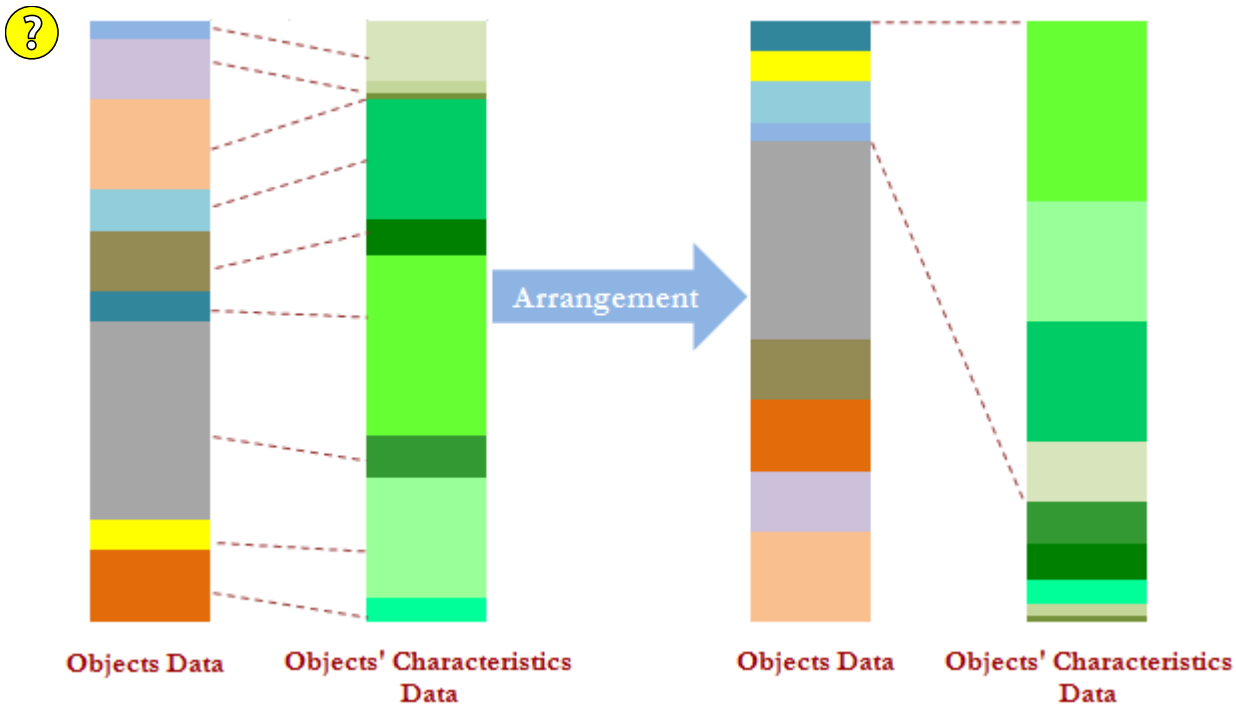

Figure 1. The 80/20 Analysis procedure

The 80/20 Analysis provides the quantitatively analyzing tool for descendants not only to make breakthroughs in business and economics but also to verify the validity of the 80/20 Principle. For instance, the American newspapers industry traditionally observed 80 percent of their profit came from advertising and 20 percent came from subscriptions (The Economist 2011). In 1960s, IBM studied that 80 percent of computer time usage being spent on 20 percent of the operating code. Subsequently, they rewrote its operating software to make the most used 20 percent very accessible and user friendly, which resulted in the IBM computers running application faster than those of their rivals. (Koch 1998, 9.) Many scholars have adopted the analysis in their researches such as Juan (1960) recognized the phenomenon that quality losses were tremendously converged on a few errors, Karuppusami and Gandhinathan (2006) reviewed and analyzed empirical studies to name few vital critical success factors in total quality management, Cervone (2009) found out and addressed most influential factors for the success of a digital library project as well as Fotopoulos, Kafetzopoulos & Gotzanami (2011) identified critical elements that affected significantly the implementation of food safety assurance systems. Another application of the analysis is in marketing and sales for example 80 percent of profit is from about 20 percent of

customers or customer complaints with 80 percent of complaints will come from 20 percent of products (Craft & Leake 2002, 730).

3.2 Pricing decisions

One of the most important decision ought to be made in most of businesses is to set product prices that are considered as the visualization of product values. Nevertheless, it does not necessarily mean that the product price and the product value are proportional. Pricing is a rather complex business matter and requires cross-collaborations between departments from procurement, production, distribution to marketing, sales and customer services. In spite of the complication of product pricing, the fairly comprehensive understanding about this issue can be obtained via product cost analysis and pricing methods. Both of them are discussed after the general introduction of cost terminologies.

3.2.1 Cost terms and purposes

This part will explain several cost terms that support general knowledge about costs to facilitate the discussions in subsequent chapters. For consistency, all presented definitions are taken from the textbook – Cost Accounting: A Managerial Emphasis (Horngren, Datar, Foster, Rajan & Ittner 2009) and accompanied with further grasps of the author.

Cost is defined as "a resource sacrificed or forgone to attain a particular objective". A cost is usually measured as the monetary amount that must be spent to obtain goods or services. An **actual cost** is "the cost incurred (a historical or past cost)" while a **budgeted cost** is "a predicted or forecasted cost (future cost)". The cost examining always appears when there is a need of finding the cost of a **cost object** that is anything for which a measurement of cost is requested. Several types of cost object are exampled in Table 1. (Horngren et al. 2009, 53.)

Table 1. Examples of cost objects

Cost object	Illustration
Product	A package of cashew kernel
Service	A sight-seeing tour around Helsinki
Project	A graphic design work for a webstie
Customer	A bakery (customer) who bought flours from a manufacture
Activity	Preparing raw materials for making bread at a bakery
Department	Maintainance, Delivery and Customer Support Department

The costs of a cost object are typically determined in two basic stages: accumulation and assignment. **Cost accumulation** is "the collection of cost data in some organized way by means of an accounting system". For instance, at a grocery store, an owner must gather costs in various classifications such as different purchasing prices of goods, different salaries amount of employees and costs paid for storing goods. Afterwards, the costs are often classified as either direct or indirect costs. **Direct costs of a cost object** are "costs related to the specific cost object and can be traced to it in an economically feasible (cost-effective) way". For instance, the cost of tires is the direct cost of a bicycle. **Indirect costs of a cost object** are, on the other hand, "costs related to the specific cost object but cannot be traced to it in an economically feasible (cost-effective) way". The cost of monthly electricity incurred at a bicycle factory is, for example, the indirect cost to produce a bicycle. The electricity is not only used to make bicycles but also is consumed by other things in the factory such as lighting, heating and fan systems. Accordingly, it is rather difficult to determine the exact electricity cost of each bicycle. The indirect cost is allocated instead of being traced to a cost object, which is termed as **cost allocation**. **Cost assignment** refers to either as direct cost tracing to a cost object or as indirect cost allocation to a cost object. Figure 2 depicts direct costs, indirect costs and both types of cost assignment with the example of a bicycle. (Horngren et al. 2009, 53–54.)

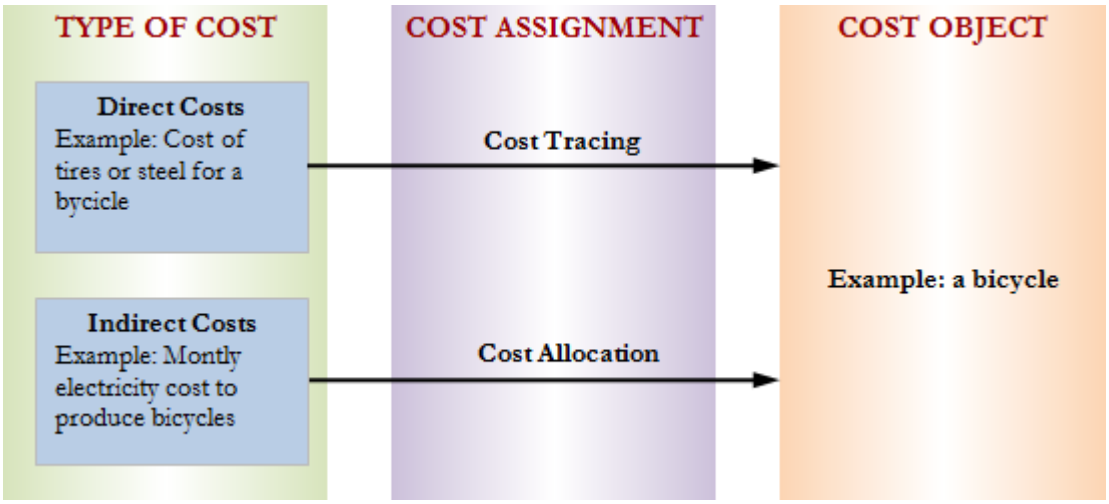

Figure 2. Relationship of direct and indirect costs to a cost object

The cost-behavior patterns of costs are seen as another way of cost classification to identify costs as variable of fixed. A **variable cost** is a cost that "changes in total in proportion to changes in the related level of total activity or volume". In contrast, a **fixed cost** is a cost "remains unchanged in total for a certain time period no matter whatever changes in the related level of total activity or volume". For instance, the cost of bicycle tires is the variable cost since the total cost of tires increases or decrease when more or less bicycles are made. In contrast, monthly cost of land leasing for a factory location is the fixed cost because the cost is paid with a constant amount regardless of the quantity of bicycles is produced. The level of activity or volume is a variable and known as a **cost driver** that is used to measure a cause-and-effect relationship between a change in the level of activity or volume and a change in the level of total costs. A variable cost always has a cost driver. For example, the quantity of bicycles produced is the cost driver of the bicycle tire cost. Since fixed costs do not hinge on the level of activity or volume, they often do not have cost drivers in the short run. However, if fixed costs may change in the long run due to alterations of the level of activity or volume, the cost drivers of fixed costs are identifiable. Figure 3 depicts the relationships between the two mentioned categorizations of costs namely direct/indirect and variable/fixed. (Horngren et al. 2009, 56–58.)

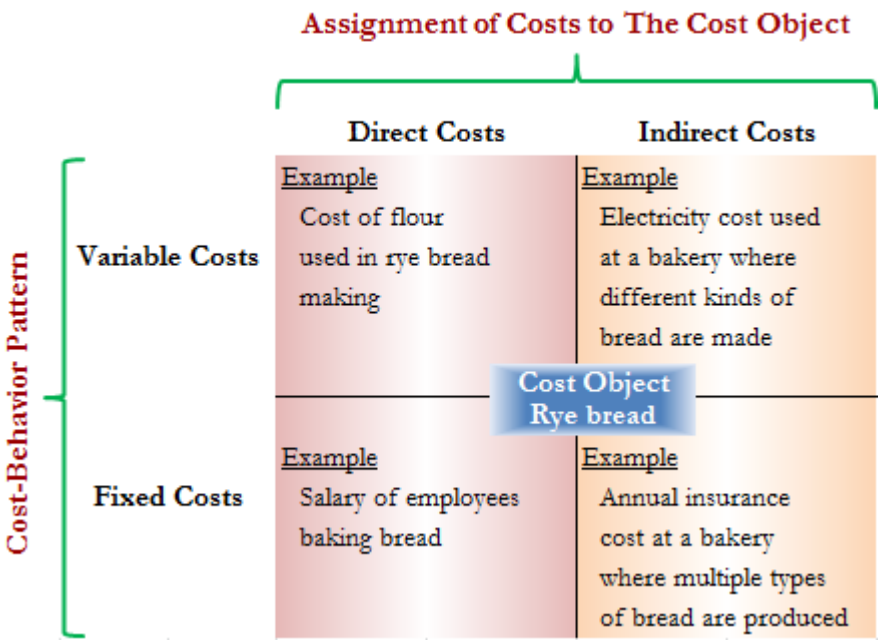

Figure 3. Relationships of types of costs

Although managers generally make decision based on total cost, a unit cost also plays the tremendous role in some contexts, especially in this study. A **unit cost** or **average cost** is "a cost computed by dividing total cost by the number of units". The unit might be interpreted as automobiles assembled, packages delivered, hours worked or the quantity in kilo. (Horngren et al. 2009, 61.)

3.2.2 Cost analysis

The cost analysis is a procedure to examine the total costs of a cost object in a great detail to provide the better understanding of how costs are absorbed during the manufacture or formulation process of products. The cost information is firstly obtained via cost accumulation. Then, the costs are classified as direct/indirect and variable/fixed costs. Finally, the cost assignment ends with cost tracing for direct costs or cost allocation for indirect costs. The full picture of costing is assembled from smaller cost pieces, which will enable managers to control more efficiently and more precisely. Figure 4 portrays visually the cost analysis steps.

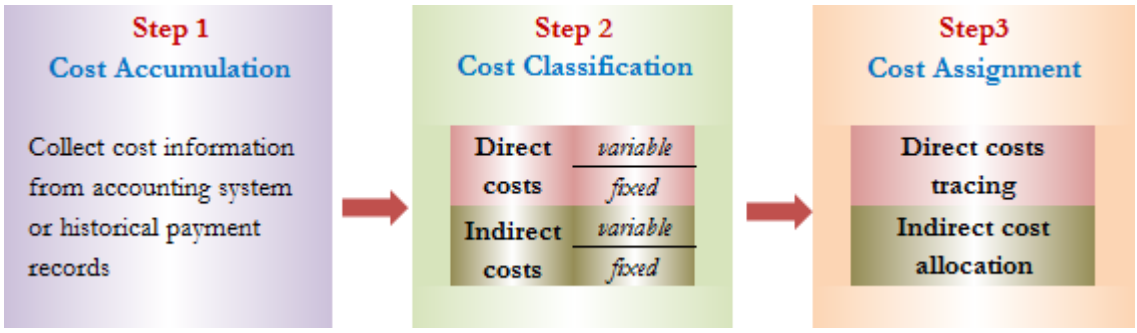

Figure 4. Cost analysis steps

The more costs are identified from a cost object; the more insights of costing are perceived. However, obtaining too many cost items may cause a complex cost structure and requires substantial commitment of resources such as time, money and labor, which sometime outweighs the benefits of getting the cost information. The analysis should, therefore, be done to select only material costs for further investigation. In practice, indirect costs are often combined as a group to ease the cost allocation. The group of costs is called as a **cost pool** – "a grouping of individual costs items" (Horngren et al. 2009, 124).

3.2.3 Cost-plus pricing

There are various pricing methods, of which twelve are found popular and belong to three large categories namely cost based, competition based and demand based (Avlonitis & Indounas 2005, 48).

Cost-based methods: pricing methods developed depending on merely cost information.

- **Cost-plus method**: a profit margin is added on the product's average cost to form the product price.
- **Target return pricing**: the price is identified at the point that results the company's target rate of return on investment.
- **Break-even analysis**: the price is determined at the point where total revenues equal to total costs.

- **Contribution analysis**: the price is found by conducting the break-even analysis but only direct variable costs are considered.
- **Marginal pricing**: the price is set below total and variable cost to cover merely marginal costs.

Competition-based methods: the methods take into account the competitor prices.

- **Pricing similar** to competitor or based on the market's average prices.
- **Pricing above** competitors or market's average prices.
- **Pricing below** competitors or market's average prices.
- **Pricing according to the cardinal price** in the market – the leader's price that is adopted by the rest of firms in the market.

Demand-based pricing: the methods use demand information to formulate the price.

Perceived-value pricing: the price is hinged on the customers' perceptions of value.
Value pricing: a fairly low price is charged for a high quality service.
Pricing according to the customers' needs: the price is set to satisfy customers' needs.

Among the aforesaid pricing methods, cost-plus pricing appears to be the most widely-used by firms (Govindarajan & Anthony 1983; Mills 1988; Avlonitis & Indounas 2005, 52). The method adds a mark-up in a form of percentage to a cost base for setting a price, which is explained by the general formula (figure 5). Therefore, the cost analysis is the prerequisite for this method since it gathers cost information of a product to form a product cost base. Furthermore, the analysis also provides deep understandings of how costs behave or influence a cost object, which enables managers to construct the cost-plus pricing method with ease.

Cost base	€A
Mark-up component *(B = m% x A)*	B
Potential selling price	€A + B

m: mark-up percentage

Figure 5. The general cost-plus pricing formula

Many companies have realized and considered the significance of the cost-plus pricing method, for example companies in UK and Australia were found to have high awareness of the method (Guilding, Drury & Tayles 2005, 130–131). The reasons for those findings might be due to several critical advantages of the method. Using cost-plus method can help managers not only to calculate and manage prices more easily but also to stabilize the market. Nonetheless, it also has some drawbacks such as the disregard of customers and competitors as well as the opportunity cost. (Dolgui & Proth 2010, 104.) Although there is a wide variety of pricing methods exploited, the good one, no matter whatever objectives it has, ought to take into account factors that are major influences on pricing decisions such as customers, competitors and costs (Horngren et al. 2009, 455).

3.3 Forecasting

Uncertainty is the matter which every company wants to mitigate but cannot avoid. The issue arises mainly as the future of a business is a mystery with numerous questions, for instance, whether purchasing prices of products go up or go down in the next six months, whether new competitors enter the market in the next quarter, what happens if substitute products or services emerge or how customers behave in the next month. All questions hint that there is a need to predict the future. In the business context, there are several methods which are developed to portray the future picture of business. The practice that companies apply these methods is known as forecasting. The section will introduce the concepts of forecasting, forecasting methods and go into detail about the time series forecasting model.

3.3.1 Rules of forecasting

A forecast is defined as a future estimate of some variable. In the context of inventory management, common variables are inventory levels, supply levels and demand levels. (Bozarth & Handfield 2008, 266.) The study focuses on discussing demand forecasting. There are several basic rules of forecasting which will help to avoid the misapplication and misinterpretation of forecast results.

Rule 1: Forecasts are always inaccurate

No forecasting approach can yield the exact level of future results even in the best conditions. There are too many factors influencing a forecast and it is impossible to take all of them into consideration. However, the forecast is still useful since it can depict partially the future and consequently reduces the future uncertainty. Forecasting methods are used to get estimates which company should adjust with forecast error measures to get the better estimations. (Bozarth & Handfield 2008, 269.)

Rule 2: Forecast in short-term is more accurate than in long-term

In the short-term, factors that can impact a forecast do not change substantially, which will make a forecast more reliable. Additionally, resources of companies are often managed efficiently in the short-run, which also enhances the forecast accuracy. (Bozarth & Handfield 2008, 269.)

Rule 3: Forecast for groups of products tend to be more accurate

In practice, it is easier to forecast the demand of all cars rather than the demand of a specific type of cars, for instance, red cars. The red color is a factor that impacts the choice of consumers. However, the effect of color fashion will vanish if the forecast is made for the aggregate demand of cars rather than for the particular demand of red cars. The rule can be reasoned as an underestimate or overestimate of the demand of a

product is balanced out by demands of other homogeneous products. (Bozarth & Handfield 2008, 269.)

Rule 4: Forecasts cannot substitute for calculated values

Forecasts should be used only if better approaches to measuring the variable of interest are not available. The rule encourages the calculations of demand if applicable, which yield accurate results instead of estimating the demand which is closely accurate or inaccurate. For instance, a company producing candy can easily calculate how much monthly sugar they need by using precise formulas instead of estimating it based on past figures which may change significantly in the future. (Bozarth & Handfield 2008, 270.)

Rule 5: Forecasts are more accurate with more information from consumers

The more information a company gets from consumers, the better forecast is made. The sales are made based on consumer demand. Therefore, if consumers involve in making the forecast, the demand is estimated with less errors. In practice, it is difficult to make collaborative forecast since it requires considerable commitments of resources from both parties. (Chopra & Meindl 2010, 199.)

3.3.2 Forecasting methods

There is a myriad of forecasting methods available to forecast the demand. The question is how to select the appropriate one. That depends on situations and purposes of forecasting practice. There are two categories of forecasting methods namely qualitative forecasting methods and quantitative forecasting methods.

Qualitative forecasting methods refer to forecasting techniques based on intuition or informed opinion. Qualitative methods are used when the data are scarce, not available or irrelevant. Furthermore, the impossibility or difficulty to model quantitatively the relationship between past events and future events also enable

qualitative methods usage. Qualitative methods include the following techniques: (Bozarth & Handfield 2008, 270–271.)

- **Market survey:** structured questionnaires are used to collect information from potential customers. Potential demand is gauged based on the obtained results. (Bozarth & Handfield 2008, 271.)
- **Panel consensus forecasting:** a forecast is derived from the discussions of a group of experts who are gathered purposely and selectively by an organization (Bozarth & Handfield 2008, 271).
- **Delphi method:** a method allows a group of experts to develop forecasts individually. Each forecast is then shared among the group to get feedbacks from participants. Subsequently, each participant modifies his or her own forecast according to the advices and critics of the others. The process is repeated until a consensus is reached. (Bozarth & Handfield 2008, 271.)
- **Life cycle analogy method:** there is a conventional fact that each product or service has a life cycle consisting of an introduction stage, a growth stage, a maturity stage, and a decline stage. Employing the knowledge, the method attempts to determine the time frames and levels for every stage of a product life cycle. (Bozarth & Handfield 2008, 271.)
- **Build-up forecast:** a method to get individuals who familiar with a particular market to forecast the demand of customers in the market. Each estimate is then aggregated to yield an overall forecast. (Bozarth & Handfield 2008, 271.)

Unlike qualitative forecasting methods, **quantitative forecasting methods** use measurable, historical data to formulate forecasts. Quantitative forecasting methods are divided into two main types: casual models and time series models. (Bozarth & Handfield 2008, 270.)

- **Time series models** view the future level of demand as a function of time (Bozarth & Handfield 2008, 270). The model is appropriate when a demand pattern does not vary significantly from years to years (Chopra & Meindl 2010,

200). Researchers, scholars and practitioners have developed several time series models such as moving average, weighted moving average, static method, simple exponential smoothing, Holt's model, Winter's model and linear regression model (Bozarth & Handfield 2008, 270–299; Chopra & Meindl 2010, 205–213). In time series models, the most important factor to develop forecasts is the data that must include the chronology of observations and their values. There are inherent elements that should be considered when building and using time series models such as randomness, trend and seasonality in any data set. **Randomness** refers to the unpredictable demand from one period to the next. **Trend** means the long-term variation either up or down of the demand. **Seasonality** is a pattern of spikes or drops repetitively occurs in a time series linked with a certain times of the year. (Bozarth & Handfield 2008, 272.)

- **Casual models** are based on the assumption that the future level of demand is seen as a function of something other than time. Linear regression model and multiple regression models are commonly used methods to establish causal relationship between demand and other factors. (Bozarth & Handfield 2008, 270.)

The definitions and discussions of all quantitative methods are beyond the scope of this study. Additionally, doing so will divert the study from its main points. Instead, the emphasis is placed on linear regression method that is thought as the most suitable method for this study.

3.3.3 Linear regression forecasting

Linear regression is a statistical technique that represents the forecast variable as a linear function of an independent variable (Bozarth & Handfield 2008, 272). Particularly, linear regression uses historical data to assess the intercept term and slope coefficient for the line, which are expressed in the following formula:

$\hat{y} = \hat{a}x + \hat{b}$ (1)

where:

$\hat{y}$ = forecast for dependent variable, y

x = independent variable, x, used to forecast

$\hat{a}$ = estimated slope coefficient for the line

$\hat{b}$ = estimated intercept term for the line

$\hat{a}$ and $\hat{b}$ are calculated using the below formulas:

$$\hat{a} = \frac{\sum_{i=1}^{n} x_i y_i - \frac{(\sum_{i=1}^{n} x_i)(\sum_{i=1}^{n} y_i)}{n}}{\sum_{i=1}^{n} x_i^2 - \frac{(\sum_{i=1}^{n} x_i)^2}{n}} \quad (2)$$

and

$$\hat{b} = \bar{y} - \hat{a}\bar{x} \quad (3)$$

where:

(x_i, y_i) = matched pairs of observed (x, y) values

$\bar{y}$ = average y value

$\bar{x}$ = average x value

n = number of paired observations

The linear regression forecasting formula tackles the randomness and trends in a data set. However, the model does not take into account the seasonality of the demand pattern that often occurs in practice. The forecast figures, therefore, should be adjusted to consider the seasonal characteristic of the demand. A simple four-step is introduced for the seasonal adjustment as follows (Bozarth & Handfield 2008, 287):

1. For each demand value, calculate its forecast using the unadjusted forecasting model, particularly in this case, the linear regression forecasting model.

2. For each demand value, calculate the ratio of demand to forecast. The forecast model is over-forecasting or under-forecasting if the ratio is less than one or larger than one respectively.
3. The ratios of corresponding months, quarters or periods are averaged to obtain the seasonal index if the time series spans multiple years. Otherwise, use the ratio calculated in step 2 as the seasonal index.
4. Multiply each unadjusted forecast figure by the corresponding seasonal index to get seasonally adjusted forecast values.

Forecast numbers of the linear regression model with the seasonal adjustment provide a company the future scenario of the customer demand. The model is fairly easy to apply in practice and is adopted by many companies. The study will exploit the model to calculate future demands of critical products of the case company.

3.3.4 Measures of forecast accuracy

Forecasting models estimate the uncertainty in the future based on the historical facts. Therefore, it is incapable of avoiding the forecasting inaccuracy of the models. However, the forecast errors are measurable to a certain degree. Three simple measures are commonly used to evaluate the forecast accuracy are introduced as follows (Bozarth & Handfield 2008, 296):

Forecast error (FE)=(actual value –forecasted value) (4)

Mean forecast error $(MFE)=\frac{\sum_{i=1}^{n} FE_i}{n}$ (5)

Mean absolute deviation $(MAD)=\frac{\sum_{i=1}^{n} |FE_i|}{n}$ (6)

where

$\sum_{i=1}^{n} FE_i$ = sum of the forecast errors for periods 1 through n.

MFE tells how the forecast model is bias, or the tendency of a model to under- or over-forecast. A model is said completely unbiased if its *MFE* equals zero. A model with negative *MFE* indicates that in general, the model over-forecasts while a positive suggests that the model under-forecasts. (Bozarth & Handfield 2008, 297.)

By calculating the average of forecast error absolute values, *MAD* measures the average size of the errors with paying no attention to direction In other words, an under-forecasting method and an over-forecasting method having the same *MAD* value are considered to have the same error impact. *MAD* is a non-negative number. The ideal model has a *MAD* of zero. Both *MFE* and *MAD* should be calculated because a model might have *MFE* of zero but *MAD* is considerably large, which shows the unbiased but largely erroneous model. (Bozarth & Handfield 2008, 297.)

4 Product analysis

After collecting all necessary data from the case company, the data analyses are carried out to solve the investigative questions. The analyses will process the data and turns it into more valuable information by using the methods discussed in chapter 3. The outcomes of these analyses are vital for not only interpreting the concurrent problems of the case company but also establishing methods that are applicable in business practices. The discourse will start with product analysis, then cost analysis and finally inventory management.

The case company has about thirty products that require a lot of efforts if all of them are examined. Even if all products can be studied, it is not worth doing so inasmuch as the 80/20 Principle already affirms that there are always a few important products of the business. Finding critical products is consequently a foundation for the rest of study works.

4.1 Products selection

The historical sales data in Vietnam Dong (VND) of the case company between 2009 and 2011 was collected for the analysis (Attachment 2). The data was also turned into percentage for the later analysis. Nonetheless, the data is realized inhomogeneous with respect to the products during the studied period (Attachment 3). As can be seen, there are domestic products sold by the case company including Kernel BB, Broken Kernel, Kernel LP, Special Kernel, Kernel WS and Kernel SP. They are out of the scope of this study that takes into account only import products. Additionally, there are several import products which were not available for sale during the whole three-year period. For instance, Brown Almond Medium Diced and Powder Almond (without skin) were only traded in 2009; Preserved Dried Strawberry Fine Cut and Strawberry (dice) could be found solely in 2010 and 2011 respectively. These changeable import products are classified into two groups. The first group consists of products that are removed either in 2010 or 2011 and the second group comprises products that are added recently either in 2010 or 2011 (Table 2).

Table 2. Changeable import products (2009–2011)

	Product	Year		
		2009	2010	2011
Group 1	Brown Almond Medium Diced			
	Powder Almonds (without skin)			
	Mixed fruits			
	Natural Golden Raisin			
	Golden Raisins Jumbo			
	Dice Cranberry			
	Golden Raisin			
	Preserved Dried Strawberry Fine Cut			
Group 2	Dried Red Cherry			
	Dried Cranberry (dice)			
	Pumkin Seed GWS AA			
	Sultanas Raisins			
	Sunflower Seeds			
	Wild Blueberries			
	Black Current			
	Dice Mango			
	Dice Papaya			
	Diced Pineapple			
	Macadamias (dice)			
	Strawberry (dice)			

Notes

: Product availability

The products of group 1 are indubitably inefficient products because they were removed during the business development. The case company decided to stop selling these products possibly for their poor profits or low demands. The products belongs to group 2 are tricky because they are purposely added either to respond to the market demands or to diversify the case company products. Hence, they are possibly critical products of the case company. Nevertheless, the products of group 2 are also omitted because there is not sufficient information such as their sales data in 2009, which makes the analysis more difficult and inconsistent. Moreover, vital products are understood as products that are not changed or be taken out during the studied period. Consequently, to make the data homogenous in the context of this study, domestic products and changeable ones ought to be ignored from the obtained data to form the investigative data. The omission of irrelevant products creates a list of products left, which are visualized in Table 3. The number of products to handle reduces

significantly from about thirty to only seventeen now and sales data of them in three years were collated (Attachment 4).

Table 3. Products for study

Number	Product	Year		
		2009	2010	2011
1	Blanched Sliced Almond			
2	Blanched Sliver Almonds			
3	Natural Whole Almonds (without skin)			
4	Natural Whole Almonds (with skin)			
5	Almond Dice			
6	Powder Almonds			
7	Cranberry (Soft Moist)			
8	Dice Praline Almond			
9	Dried Apricot			
10	Figs			
11	Hazel Nuts			
12	Macadamia 1			
13	Natural Yellow Raisins			
14	Pecan			
15	Prunes			
16	Thompson Seedless Raisins			
17	Walnut			

Notes

: Products availability

4.2 Application of the 80/20 Analysis

According to the 80/20 Principle, it is predicted that 20 percent of a number of the products for study constitutes critical products that are about four products (rounding from the calculation of 0.02 x 17). Further, these four products will account for about 80 percent of product sales. The 80/20 Analysis in this section will show if the prediction is accurate. It is recalled from the theory that two sets of data – objects data and objects' characteristic are needed for the analysis. In this case, the objects refer to products and objects' characteristic is the product sales.

The sales data in percentage of the selected products was recalculated and sorted in descending order for each year. Then, the cumulative sales figures in percentage were computed to show the contribution of different products to the whole sales of the selected products. Both sales and cumulative sales in percentage are marked with an

asterisk to show that they are adjusted figures that differ from the original ones and apply only to partial data. A group of products which account for approximately 80 percent of total sales of the whole considered group is highlighted. The illustration of this work is exampled by using the 2009 sales data (Table 4.).

Table 4. The 80/20 Analysis of sales data (2009)

Rank	Product	2009		
		Sales (VND)	Sales* (%)	Cumulative Sales (%)
1	**Blanched Sliced Almond**	502,256,277	27.46%	27.46%
2	**Powder Almonds**	414,556,664	22.67%	50.13%
3	**Thompson Seedless Raisins**	227,421,000	12.43%	62.56%
4	**Walnut**	119,711,000	6.55%	69.11%
5	**Macadamia 1**	98,988,095	5.41%	74.52%
6	**Prunes**	97,940,514	5.35%	79.87%
7	**Hazel Nuts**	**52,390,000**	**2.86%**	**82.73%**
8	Natural Whole Almonds (with skin)	44,355,000	2.43%	85.16%
9	Cranberry (Soft Moist)	42,260,952	2.31%	87.47%
10	Dried Apricot	41,395,000	2.26%	89.73%
11	Natural Whole Almonds (withour skin)	36,000,000	1.97%	91.70%
12	Natural Yellow Raisins	33,191,970	1.81%	93.51%
13	Figs	29,735,000	1.63%	95.14%
14	Almond Dice	28,919,000	1.58%	96.72%
15	Dice Praline Almond	22,660,000	1.24%	97.96%
16	Blanched Sliver Almonds	20,795,000	1.14%	99.10%
17	Pecan	16,434,800	0.90%	**100.00%**
	Total	**1,829,010,272**	**100.00%**	

Note

*: Adjusted figures

There was a group of seven products in 2009 found matching the criteria of the 80/20 Analysis. The study needs to see results of the other years. The similar analyses of 2010 and 2011 were performed (Attachment 5) and the comparison of results can be seen in Table 5.

Table 5. Data comparison of selected products

Product	2009	2010	2011
	Sales* (%)	Sales* (%)	Sales* (%)
Blanched Sliced Almond	27.46%	27.87%	28.33%
Powder Almonds	22.67%	19.49%	17.16%
Thompson Seedless Raisins	12.43%	7.27%	
Walnut	6.55%	11.08%	19.45%
Macadamia 1	5.41%	5.17%	6.41%
Prunes	5.35%	4.36%	4.20%
Hazel Nuts	2.86%		
Natural Yellow Raisins		7.71%	5.40%
Total	82.73%	82.95%	80.95%

Note

*: Adjusted figures

: Not selected in the year

4.3 Critical products

According to Table 5, there are several products that belong to the critical group in certain year(s) but not in the others. For instance, Thompson Seedless Raisins accounted for about 13 percent and 7.5 percent in 2009 and 2010 respectively but only 2 percent in 2011. The decreasing share of this product implies either its low demand or the shift in the demand toward another substitute. Natural Yellow Raisins, in contrast, has a low share in 2009 (1.88%) but fairly high in 2010 (7.71%) and 2011 (5.40%). The increment of sale since 2009 may show the increasing importance of this product but the low sale contribution in 2009 presents its inconsistency. Hazel Nuts portrays a different picture. Although it was listed in the group of 2009, it was out of the critical group in the next two years. In order to keep the consistency of the study, these three products are dismissed. Indeed, other products in the group present the stability or the improvement in sales during the investigative period. The data is revised in the table below (Table 6).

Table 6. Critical products

Product	2009	2010	2011
	Sales (%)	Sales (%)	Sales (%)
Blanched Sliced Almond	27.46%	27.87%	28.33%
Powder Almonds	22.67%	19.49%	17.16%
Walnut	6.55%	11.08%	19.45%
Macadamia 1	5.41%	5.17%	6.41%
Prunes	5.35%	4.36%	4.20%
Total	**67.44%**	**67.97%**	**75.55%**

Note

*: Adjusted Figures

Based on the analysis, the study identified five critical products, which are Blanched Sliced Almond, Powder Almonds, Walnut, Macadamia 1 and Prunes (Table 6). Their total shares are about 70 percent to 75 percent during the considered period of time. From now on, the discussion will focus mainly to these five products to analyze them in terms of cost structure and demand forecasting.

5 Cost analysis

The cost analysis is performed as the next step following critical products determination to respond to product pricing investigation. The chapter will examine a cost structure of critical products by dissecting different steps. The cost categorization is carried out first to identify important cost items of critical products. Afterwards, these cost items are analyzed to examine the cost per kilo of each product.

5.1 Cost categorization

Cost categorization includes cost information collection and cost sorting, which are applied to cost objects – critical products. Some conversations with the case company manager did provide tremendous insights of product costing, which assists in arranging different costs based on two major costs classifications – direct/indirect and variable/fixed (figure 6).

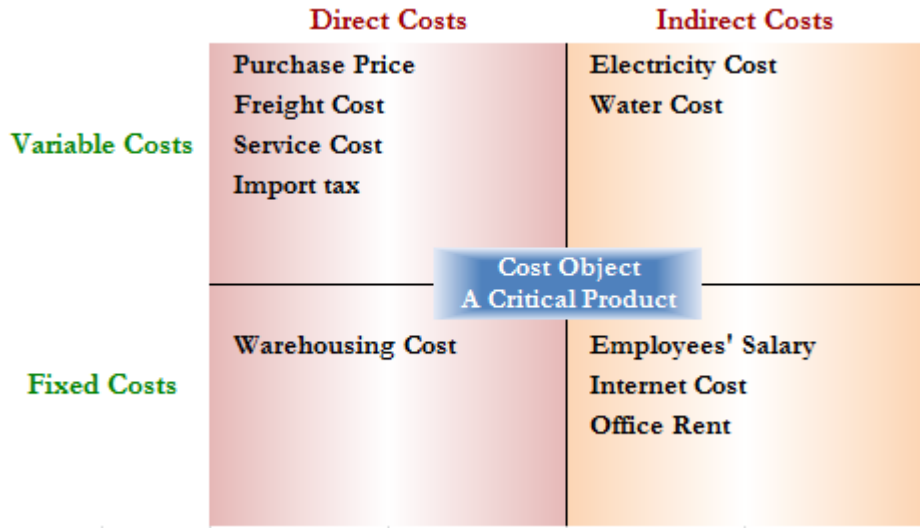

Figure 6. Cost categorization of critical products

The cost sorting criteria are derived from the definitions of direct/indirect costs and variable/fixed costs. Accordingly, purchasing price, freight cost, service cost and import tax are direct variable costs of critical products as they can be traced to the products in an economical way and vary when there are changes in a number of products purchased. The service cost is a unique item of the case company, which

refers to the costs incurred to hire a service that takes care of all formalities at the Customs, obtains necessary documents and certificates as well as transports the goods to the case company's warehouse. Electricity and water costs do not relate directly to critical products and vary monthly; hence they are classified as indirect variable costs. The warehousing cost is the direct fixed cost since it is unchanged during the period and must be paid for storing products. Salaries of employees, internet costs and office rents are obviously indirect fixed costs. The study identified a more number of cost items of critical products and not all of them were listed in Figure 6. Nonetheless, unlisted cost items are insignificant and will be covered by the product markups.

The cost categorization is an essential prerequisite for processing cost data as it tells which methods, cost tracing or cost allocation, should be used to assign the costs to the critical products. Furthermore, the information about cost behaviors also helps with the calculations. The direct variable costs are viewed as the most important costs because they ought to be incurred to acquire the goods for sale. Consequently, figuring out how to trace them to critical product is vital for product pricing.

The direct variable costs that are ascertained including purchasing price, freight cost, service cost and import tax. The next four sections present comprehensive discussions to explain how to trace these costs to the critical products. Hence, the first priority is to determine the cost driver as a variable for the tracing process. Because the critical products are sold by weight, the most appropriate factor seems to be the product quantity in kilo. In other words, the sections will demonstrate the ways to find direct variable costs per kilo of each critical product. Since all critical products have the same direct cost tracing method, the calculations of just Blanched Sliced Almond in 2009 are presented in detail as the illustrations. Within each section, there will be an analysis of results to discover whether there are any changing patterns of direct variable costs or any interesting findings.

5.2 Purchasing price

Purchasing price is the first cost the case company has to pay for their suppliers to get the goods. The case company has contracted with some suppliers in Thailand and China to deliver the products by shipments when orders are made. Each shipment contains almost all product cost information. The case company has received about ten to fifteen shipments yearly, but not all of them included critical products. The study, thus, will consider only the shipments that contain the critical products (Attachment 6).

According to Attachment 6, the shipment information consists of the shipment number, the exchange rate (USD/VND), the total value of the shipment measured in both US dollar (USD) and Vietnam Dong (VND), the total freight cost of the shipment (VND) and the total quantity of the shipment (kg). In addition, the quantity of critical products in each shipment is also presented. Because the shipments not only contain the critical products but also transport other products, the total quantity of shipments and the total quantity of critical products are different. All pieces of shipment information will be clarified and utilized gradually in later sections. Most of the shipments carry two or three critical products, even some shipments had only one critical item. The relevant shipments when calculating direct variable product costs are, therefore, those containing the product.

5.2.1 Weighted average purchasing price

Although the price information of critical products could be included in the shipment information, it was not shown in Attachment 6. The reason is due to the fact that the purchasing prices are different from each other and that they also vary in each shipment. Hence, the purchasing price data of each critical product will be presented separately. The purchasing price data of Blanched Sliced Almond in 2009 can be seen in Table 7.

Table 7. Purchasing price of Blanched Sliced Almond (2009)

2009				
Shipment Information		Blanched Sliced Almond		
No.	Exchange Rate (USD/VND)	Purchasing Price (USD/kg)	Purchasing Price* (VND/kg)	Quantity (kg)
776	16 973	7,71	130 862	454,00
35347	16 938	7,71	130 592	272,40
9285	16 956	7,20	122 083	1 000,00
31269	16 966	7,00	118 762	908,00
27849	16 999	5,90	100 294	2 000,00
Total				4 634,40

Notes

*: Round figures

The shipment numbers is the document numbers at the Customs, which is used to distinguish between different shipments. The product purchasing price is measured in both USD/kg and VND/kg. The study only takes into account the purchasing price in VND, which is the national currency of Vietnam. The purchasing price (VND/kg) varies every shipment due to the changes of either the purchasing price in USD or the exchange rate. The exchange rate is "the price of one currency in terms of another" (Krugman, Obstfeld & Melitz 2012, 350). The exchange rate quotation USD/VND is not the measurement unit of the exchange rate but the measurement of how much one USD is worth in VND. For instance a quotation USD/VND 16,500 means that one USD is exchanged for 16,500 VND. During the last three years, the average exchange rate of USD in VND is about 19,340 (Forexpros 2012).

There are different purchasing prices (VND/kg) in 2009, which arises a need to find the common price for the year (Table 7). The average purchasing price would be a good measure, but it is not appropriate in this case, especially when each price corresponds to different quantities. Therefore, the weighted average price is thought a better measure, which is expressed in the following formula:

$$\bar{p} = \frac{\sum_{i=1}^{n} p_i \, q_i}{\sum_{i=1}^{n} q_i} \quad (7)$$

where:

p_i =the purchasing price of a product of the shipment i (VND/kg)

q_i =the product quantity of the shipment i (kg)

$\bar{p}$ = the weighted average purchasing price of a product of a year (VND/kg)

The weighted average purchasing price is calculated to balance the combination of various prices of shipments. In other words, the weighted average purchasing price can be replaced with the prices of every shipment without changing the total amount the case company paid for the product. The weighted average purchasing price of Blanched Sliced Almond in 2009 is shown in Table 8. The weighted average purchasing prices of all critical products during three years can be found in Attachment 7.

Table 8. Weighted average purchasing price of Blanched Sliced Almond (2009)

2009					
Shipment Information		Blanched Sliced Almond			
No.	Ordinal No.	Purchasing Price * (VND/kg)	Quantity (kg)	Purchasing Value* (VND)	Weighted Average Purchasing Price* (VND/kg)
	i	p_i	q_i	$p_i q_i$	$\bar{p}$
776	1	130,862	454.00	59,411,348	113,389
35347	2	130,592	272.40	35,573,261	
9285	3	122,083	1,000.00	122,083,000	
31269	4	118,762	908.00	107,835,896	
27849	5	100,294	2,000.00	200,588,000	
Total			4,634.40	525,491,505	

Notes

*: Round figures

Let P_i be the multiplication of the purchasing price and the quantity ($P_i = p_i q_i$), the formula (7) can be transformed to a new formula:

$$\bar{p} = \frac{\sum_{i=1}^{n} P_i}{\sum_{i=1}^{n} q_i} \quad (8)$$

where:

P_i = the purchasing value of a product of the shipment i (VND)

q_i = the product quantity of the shipment i (kg)

$\bar{p}$ = the weighted average purchasing price of a product of a year (VND/kg)

Formula (8) simply shows that if the purchasing value – the multiplication of the purchasing price and the product quantity is known in advance, the weighted average purchasing price of a certain year can also be calculated. The formula will be employed in the subsequent sections to calculate the weighted average freight cost, the weighted average service cost and the weighted average import tax.

5.2.2 Purchasing price analysis

The analysis aims to find a way to handle the purchasing price, more specifically, to look for a method which can be used to estimate the purchasing price. The weighted average purchasing price calculations in the previous part are not utilized in this analysis for several reasons. Firstly, the purchasing price data is available. Secondly, the weighted average purchasing price is created to replace real purchasing price figures of a year. Hence, the changing pattern of the real prices cannot be seen by just looking at the weighted average numbers. Finally, the weighted average purchasing price is calculated based on historical data, particularly one-year data, while the purchasing price is estimated or known in advance. All the mentioned arguments seem to make the weighted average purchasing price calculations redundant. However, the weighted average purchasing price will be used to estimate the freight cost, the service cost and the import tax in the next sections.

The purchasing price (VND/kg) of critical products is observably dependent on two factors which are the purchasing price (USD/kg) and the exchange rate (USD/VND). The deeper view of them is expected to draw ideas which help to estimate the purchasing price (VND/kg).

The purchasing price (USD/kg) is examined first by analyzing its data of the last three years. It is rarely that all critical products are delivered in the same shipment and most of the shipments contain two or three products. Therefore, the purchasing prices of several products are not available in a number of shipments, which are accentuated by the cells filled in with a pattern of stripes. (Table 9.)

Table 9. Purchasing prices (USD/kg) of critical products (2009–2011)

Purchasing Price (USD/kg)						
Year	Shipment Information No.	Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
2009	776	7.71			13.50	
	1179			6.22		4.28
	35347	7.71			14.50	4.28
	9285	7.20				
	31269	7.00	9.00	6.22	13.50	4.28
	74796		9.00	5.46		
	27849	5.90	5.60			
	103806			6.39	15.70	4.40
2010	16606	7.16			15.70	4.40
	1924	6.20	5.90			
	28950			9.75		
	56581	6.33				2.67
	72096			9.60		
	80440				19.50	
	22167	6.20	5.90			
	114972			10.24	19.50	4.40
2011	1186	6.35				
	11370			12.50		
	26721	6.35	6.57		19.50	4.40
	60727				21.40	4.40
	82977	6.35	6.57			
	84287	7.00	6.70	10.84		
	121791				21.40	4.75
Average*		6.73	6.91	8.58	17.42	4.23
Standard Deviation*		0.60 9.00%	1.35 20.00%	2.53 29.00%	3.16 18.00%	0.56 13.00%

Note

*: Round figures

In general, some products have fairly stable prices while the others have inconstant prices. Since the study needs fixed figures used as references to forecast the future purchasing prices, the average purchasing price of each product is thought as a good measurement. Additionally, the standard deviation is computed both in USD and in percentage to see the deviation of the data from the mean. The standard deviations in

decimal numbers do not give useful information because they are not comparable. The standard deviations in percentage of the average purchasing price are calculated to compare the deviation of critical products. Accordingly, Blanched Sliced Almond has the least deviated price with nine percent while Walnut has the largest deviation of 29 percent. The deviations of Powder Almonds, Macadamia 1 and Prunes are 20 percent, 29 percent and 13 percent respectively. The standard deviation in percentage of the average purchasing price provides a tool for adjusting price error when assessing product price.

The analysis continues with the second factor that also has a large impact on the purchasing price (VND/kg) is the exchange rate (USD/VND). The exchange rate data is processed in Table 10.

Table 10. Exchange rates of shipments containing critical products (2009–2011)

Year	Shipment Information		Exchange Rate Average* (USD/VND)	Standard Deviation*		Change*
	No.	Exchange Rate* (USD/VND)				
2009	776	16,973	17,088	345	2.02%	-
	1179	16,940				
	35347	16,938				
	9285	16,956				
	31269	16,966				
	74796	16,994				
	27849	16,999				
	103806	17,941				
2010	16606	18,544	18,690	201	1.08%	9.38%
	1924	18,544				
	28950	18,544				
	56581	18,544				
	72096	18,544				
	80440	18,932				
	22167	18,932				
	114972	18,932				
2011	1186	18,932	20,163	844	4.19%	7.88%
	11370	18,932				
	26721	20,633				
	60727	20,628				
	82977	20,608				
	84287	20,608				
	121791	20,803				

Note

*: Round figures

The exchange rate was rather stable in 2009 and 2010 with the variation from one percent to two percent of the average figures. The deviation was up to four percent in 2011. The exchange rate has increased during three years and the data suggests that the increase of exchange rate is about nine percent yearly. Despite of fluctuating within a small range, the exchange rate creates tremendous changes in the product selling price. Consequently, estimating exchange rate is helpful for product pricing to mitigate a risk of exchange rate fluctuation. One possible solution is to choose a certain exchange rate and then adding an error adjustment to form the exchange rate in use. The adjustment is recommended five percent of a selected exchange rage to create the safety cushion against the price changes. For instance, the case company may choose the rate of 21,500 as the exchange rate, the exchange rate put in use is 22,575 that is five percent higher than the former.

5.3 Freight cost

Freight cost is the cost incurred to handle goods at the port. There are several costs or fees constituting freight cost such as container freight station (CFS), terminal handling charge (THC), delivery order (D/O), handling charge (H.C), container imbalance charge (CIC) and cleaning fee. The freight cost always comprises CFS, THC, D/O and H.C while CIC and cleaning fee are charged erratically. In practice, the payment of CIC and cleaning fee depends on the shipper and the port. In this study, all freight charges and fees of each shipment is grouped into a cost pool that is total freight cost of the shipment.

5.3.1 Weighted average freight cost

Unlike the purchasing price, the product freight cost per kilo is not available. Hence, calculating the weighted average freight cost per kilo needs a different approach. Formula (8) presents a way to calculate the average purchasing price of a product when the purchasing value is known. Using the same logic, if the study gets the product freight cost, the weighted average freight cost can be computed.

Because every shipment includes different products both critical products and non-critical products, each product consumes only a part of the total freight cost of the shipment. The freight cost of a specific product of a certain shipment is calculated as the multiplication of a weight ratio and the total freight cost of the shipment, which is expressed in the following formula:

$$F_i = \frac{q_i}{Q_i} F_{ti} \quad (9)$$

where:

q_i = the product quantity of the shipment i (kg)

Q_i = the total quantity of the shipment i (kg)

F_{ti} = the total freight cost of the shipment i (VND)

F_i = the freight cost of a product of the shipment i (VND)

In the above formula, the weight ratio is the quantity of the product transported by the shipment over the total quantity of the shipment. Thus, the more weight ratio the product has in a shipment, the more freight cost it will take. It is reasonable since the product that has larger quantity requires more handling procedures, loading and unloading works. After the product freight cost is found, the weighted average freight cost is determined by the below formula that is similar with formula (8).

$$\bar{f} = \frac{\sum_{i=1}^{n} F_i}{\sum_{i=1}^{n} q_i} \quad (10)$$

where:

F_i = the freight cost of a product of the shipment i (VND)

q_i = the product quantity of the shipment i (kg)

$\bar{f}$ = the weighted average freight cost of a product of a year (VND/kg)

Using formula (9) and formula (10), the freight cost and the weighted average freight cost of Blanched Sliced Almond in 2009 are calculated (Table 11). The whole data is presented in Attachment 8.

Table 11. Weighted average freight cost of Blanched Sliced Almond (2009)

2009						
Shipment Information				Blanched Sliced Almond		
No.	Ordinal No.	Total Freight Cost (VND)	Total Quantity (kg)	Product Freight Cost* (VND)	Quantity (kg)	Weighted Average Freight Cost* (VND/kg)
	i	F_{ti}	Q_i	F_i	q_i	$\bar{f}$
776	1	2,833,056	1,544.80	832,604	454.00	1,633
35347	2	3,752,635	2,602.40	392,798	272.40	
9285	3	3,221,981	2,000.00	1,610,991	1,000.00	
31269	4	3,652,280	2,389.60	1,387,793	908.00	
27849	5	5,016,131	3,000.00	3,344,087	2,000.00	
Total				7,568,273	4,634.40	

Note

*: Round figures

5.3.2 Freight cost analysis

While the product purchasing price (VND/kg) is available, the product freight cost (VND/kg) must be calculated. Dealing with the freight cost requires a different way from what has been done for the purchasing price. As the weighted average purchasing price and the weighted average freight cost are found by using the similar formulas, there would be a mathematical expression that will help to find the freight cost if the purchasing price is known in advance. The analysis of the weighted average purchasing price and the weighted average freight cost can be found as follows (Table 12.):

Table 12. Weighted average freight cost analysis of critical products (2009–2011)

Crittical Product	Year	Weighted Average Purchasing Price* (VND/kg) $\bar{p}$	Weighted Average Freight Cost* (VND/kg) $\bar{f}$		Average*	Standard Deviation*
Blanched Sliced Almond	2009	113,389	1,633	1.44%		
	2010	117,327	1,305	1.11%		
	2011	133,973	923	0.69%		
Powder Almonds	2009	118,900	1,618	1.36%		
	2010	110,783	2,087	1.88%		
	2011	136,198	884	0.65%		
Walnut	2009	103,911	1,662	1.60%		
	2010	179,801	1,311	0.73%	1.23%	0.63%
	2011	228,828	1,049	0.46%		
Macadamia 1	2009	240,605	1,677	0.70%		
	2010	337,961	2,601	0.77%		
	2011	437,927	2,678	0.61%		
Prunes	2009	74,138	1,644	2.22%		
	2010	69,311	1,600	2.31%		
	2011	93,649	1,770	1.89%		

Note
*: Round figures

According to the table, the weighted average freight cost is calculated as in percentage of the weighted average purchasing price. The average and the standard deviation of the weighted average freight cost data are respectively 1.23 percent and 0.63 percent. Since the weighted average freight cost occupies only a small percentage amount of the weighted average purchasing price, a fair estimation of freight cost as a percentage of the purchasing price can be made without creating big impact on the selling price. To create the safety of freight cost estimation, two percent of the purchasing price is assessed as the freight cost because most of calculated figures are below two percent.

5.4 Service Cost

The next direct variable cost item that will be investigated in this section is the service cost. The case company pays for a service company to handle all formalities at the Customs office, to fill in necessary documents, to acquire mandatory certificates and to transport the goods to the company's warehouse. The case company could do the works by themselves rather than using a third party. Nevertheless, it would cost the significant time and efforts for the case company since they have not got enough

competences to deal with situations at the Customs office. Thus, using professional service company has been the best choice for the case company to get rid of such difficulties and to receive the goods quickly.

5.4.1 Weighted average service cost

The service cost is a combination of several cost items including a service fee, an import documents submission fee, a plant inspection fee and an inspection fee for quality assurance and testing center 3 (QUATEST 3). The plant inspection fee is paid to check if there are any bugs, nuts or seeds in the products, which can be harmful to the environment or can cause infectious diseases affecting human and another plants. The QUATEST 3 payment is for the checking if the goods contain any toxins and meet food safety and hygiene standards. The service company pays all inspection fees in advance, gets the inspection certificates and hands them to the case company. The total service cost of the shipments carrying Blanched Sliced Almond in 2009 was calculated in Table 13.

Table 13. Service costs of shipments containing Blanched Sliced Almond (2009)

2009					
Shipment Information					
No.	Service Fee (VND)	Documents Submission Fee (VND)	Plant Inspection Fee (VND)	QUATEST 3 Fee (VND)	Total Service Cost (VND)
776	2,750,000	30,000	285,000	500,000	3,565,000
35347	2,860,000	20,000	215,000	500,000	3,595,000
9285	2,860,000	20,000	285,000	500,000	3,665,000
31269	2,860,000	20,000	285,000	500,000	3,665,000
27849	3,080,000	20,000	285,000	500,000	3,885,000

The total service cost of a shipment is shared between all the products of the shipment. Accordingly, the critical products account for a portion of the service cost, which is called as the product service cost. The formula to calculate the product service cost is deduced from formula (9) and expressed as follows:

$$S_i = \frac{q_i}{Q_i} S_{ti} \quad (11)$$

where:

q_i = the product quantity of the shipment i (kg)

Q_i = the total quantity of the shipment i (kg)

S_{ti} = the total service cost of the shipment i (VND)

S_i = the service cost of a product of the shipment i (VND)

After knowing the product service cost, the weighted average service cost is easily derived in the same way which was employed to construct formulas (8) and (10). The below formula is used to compute the weighted average service cost of a product:

$$\bar{s} = \frac{\sum_{i=1}^{n} S_i}{\sum_{i=1}^{n} q_i} \quad (12)$$

where:

S_i = the service cost of a product of the shipment i (VND)

q_i = the product quantity of the shipment i (kg)

$\bar{s}$ = the weighted average service cost of a product of a year (VND/kg)

Using formulas (11) and (12), the weighted average service cost of Blanched Sliced Almond in 2009 was calculated (Table 14). Attachment 9 shows the weighted average service cost of all critical products. It is easily to see that there was no documents submission fee in 2011. The reason is that the Customs office has started using the electronic document system replacing the traditional paper form, which led to the reduction in the total service cost.

Table 14. Weighted average service cost of Blanched Sliced Almond (2009)

2009						
Shipment Information				Blanched Sliced Almond		
No.	Ordinal No.	Total Service Cost (VND)	Total Quantity (kg)	Product Service Cost* (VND)	Quantity (kg)	Weighted Average Service Cost* (VND/kg)
	i	S_{ti}	Q_i	S_i	q_i	$\bar{s}$
776	1	3,565,000	1,544.80	1,047,715	454.00	1,562
35347	2	3,595,000	2,602.40	376,298	272.40	
9285	3	3,665,000	2,000.00	1,832,500	1,000.00	
31269	4	3,665,000	2,389.60	1,392,626	908.00	
27849	5	3,885,000	3,000.00	2,590,000	2,000.00	
Total				7,239,139	4,634.40	

Note

*: Round figures

5.4.2 Service cost analysis

The mathematical expression between the purchasing price and the freight cost was developed in previous parts. Similarly, the analysis tries to construct the similar expression between the purchasing price and the service cost. Hence, the weighted average service cost is transformed into percentage of the weighted average purchasing price (Table 15).

Table 15. Weighted average service cost analysis of critical products (2009–2011)

Crittical Product	Year	Weighted Average Purchasing Price* (VND/kg)	Weighted Average Service Cost* (VND/kg)		Average*	Standard Deviation*
		$\bar{p}$	$\bar{it}$			
Blanched Sliced Almond	2009	113,389	1,562	1.38%		
	2010	117,327	981	0.84%		
	2011	133,973	707	0.53%		
Powder Almonds	2009	118,900	1,380	1.16%		
	2010	110,783	992	0.90%		
	2011	136,198	667	0.49%		
Walnut	2009	103,911	1,958	1.88%		
	2010	179,801	1,321	0.73%	1.18%	0.72%
	2011	228,828	825	0.36%		
Macadamia 1	2009	240,605	1,899	0.79%		
	2010	337,961	3,249	0.96%		
	2011	437,927	3,412	0.78%		
Prunes	2009	74,138	1,971	2.66%		
	2010	69,311	1,749	2.52%		
	2011	93,649	1,639	1.75%		

Note

*: Round figures

The table shows that the weighted average service cost are about one to three percent of the weighted average purchasing price. As the weighted average service cost accounts for a small percentage of the weighted average purchasing price during the last three years, the estimation of the service cost of critical products can be selected two percent of the product purchasing price. The percentage figures of Prunes in 2009 and 2010 are higher than two percent, which might question the chosen estimation. However, the higher percentage numbers of Prunes can be balanced out with the lower percentage numbers of other products, which aggregately makes the estimation less erroneous.

5.5 Import tax

Since all products are bought from abroad, their import taxes must be paid. Indeed, the import tax plays an important role in product costing and pricing. Nonetheless, the import tax might be a rather complex matter due to the fluctuation of the tax rate, the trade bloc agreements or special tax policies regarding import and export. The import tax calculation method of countries may also differ from each other.

5.5.1 Weighted average import tax

In Vietnam, an import tax is levied on an import tax base. The import tax base is calculated according to the following formula:

$$ITB_i = P_i + \frac{P_i}{V_{ti}} F_{ti} \quad (13)$$

where:

P_i = the purchasing value of a product of the shipment i (VND)

V_{ti} = the total value of the shipment i (VND)

F_{ti} = the total freight cost of the shipment i (VND)

ITB_i = the import tax base of a product of the shipment i (VND)

The import tax base of a product takes into account not only a purchasing value but also a portion of the total freight cost. The portion value equals the multiplication of a value ratio and the total freight cost of the shipment. The value ratio is formed by dividing the purchasing value by the total value of the shipment. Afterwards, the import tax is calculated by multiplying the import tax base with a tax rate. The results of import tax bases and import taxes of Blanched Sliced Almond in 2009 are calculated in Table 16.

Table 16. Import taxes of Blanched Sliced Almond (2009)

2009							
Shipment Information				Blanched Sliced Almond			
No.	Ordinal No.	Total Value* (VND)	Total Freight Cost (VND)	Purchasing Value* (VND)	Import Tax Base* (VND)	Tax Rate (%)	Import Tax* (VND)
	i	V_{ti}	F_{ti}	P_i	ITB_i		
776	1	174,142,980	2,833,056	59,411,348	60,377,885	28%	16,905,808
35347	2	159,961,625	3,752,635	35,573,261	36,407,795	28%	10,194,183
9285	3	162,777,600	3,221,981	122,083,000	124,499,482	0%	-
31269	4	297,751,603	3,652,280	107,835,896	109,158,632	28%	30,564,417
27849	5	295,782,600	5,016,131	200,588,000	203,989,741	0%	-

Note

*: Round figures

It is noticeable that the tax rate is zero percent in some shipments, which is the result of the trade bloc agreement between China and Vietnam to remove the trade barriers of two countries. The weighted average import tax is computed using the mathematical logic, which was expressed in formula (8), (10) and (12). The following formula shows how to get the weighted average import tax after knowing the import tax:

$$\overline{it} = \frac{\sum_{i=1}^{n} IT_i}{\sum_{i=1}^{n} q_i} \quad (14)$$

where:

IT_i = the import tax of a product of the shipment i (VND)

q_i = the product quantity of the shipment i (kg)

$\overline{it}$ = the weighted average import tax of a product of a year (VND/kg)

The weighted average import tax of Blanched Sliced Almond in 2009 can be seen in Table 17. The data of the weighted average import tax of all critical products are demonstrated completely in Attachment 10.

Table 17. Weighted average import tax of Blanched Sliced Almond (2009)

2009				
Shipment Information		Blanched Sliced Almond		
No.	Ordinal No.	Import Tax* (VND)	Quantity (kg)	Weighted Average Import Tax* (VND/kg)
	i	IT_i	q_i	$\bar{it}$
776	1	16,905,808	454.00	12,443
35347	2	10,194,183	272.40	
9285	3	-	1,000.00	
31269	4	30,564,417	908.00	
27849	5	-	2,000.00	
Total		57,664,408	4,634.40	

Note

*: Round figures

5.5.2 Import tax analysis

The section examines the import tax to see if there is any pattern that can help to determine the import tax based on the purchasing price. Using the same analysis that is discussed in the freight cost analysis and the service cost analysis, the weighted average import tax is expressed in the percentage of the weighted purchasing price to establish a mathematical expression between them. However, the weighted average import tax has strong product characteristics since different products incur different import tax. Hence, the results of each critical product should be analyzed separately. (Table 18.)

Table 18. Weighted import tax analysis of critical products (2009–2011)

Crittical Product	Year	Weighted Average Purchasing Price* (VND/kg)	Weighted Average Import Tax* (VND/kg)		Average*	Standard Deviation*
		$\bar{p}$	$\bar{it}$			
Blanched Sliced Almond	2009	113,389	12,443	10.97%	**11.01%**	**0.29%**
	2010	117,327	13,286	11.32%		
	2011	133,973	14,392	10.74%		
Powder Almonds	2009	118,900	3,196	2.69%	**6.77%**	**5.76%**
	2010	110,783	-	-		
	2011	136,198	14,765	10.84%		
Walnut	2009	103,911	5,299	5.10%	**2.71%**	**3.39%**
	2010	179,801	563	0.31%		
	2011	228,828	-	-		
Macadamia 1	2009	240,605	80,775	33.57%	**31.48%**	**1.82%**
	2010	337,961	103,158	30.52%		
	2011	437,927	132,863	30.34%		
Prunes	2009	74,138	24,950	33.65%	**31.47%**	**1.89%**
	2010	69,311	21,079	30.41%		
	2011	93,649	28,411	30.34%		

Note

*: Round figures

The weighted average import tax of several products such as Blanched Sliced Almond, Macadamia 1 and Prunes presented a predictable pattern. The weighted average import tax of these products during last three years belongs to certain small ranges. For example, the weighted average import tax of Blanched Sliced Almond is about 11 percent of the purchase price while the amount of weighted import tax is approximately 32 percent of the purchase price for Macadamia 1 and Prunes.

Regarding Powder Almonds and Walnut, it is challenging to contend with their data so long as their weighted average import taxes change considerably during three years and in certain years, there were even no taxes collected. The weighted average import tax rates of Powder Almonds and Walnut were about seven percent and three percent of the weighted average purchase price respectively. However, their deviation figures should be taken into account when estimating their import taxes.

In short, the import tax rate of Blanched Sliced Almond is estimated as 11 percent of the purchase price; Macadamia 1 and Prune have the same rate of 32 percent. The

figures are derived from the concrete historical data and reasonable deductions. The import tax figures of Powder Almonds and Walnut are determined, in turn, as 11 percent and 5 percent. These numbers are taken as the maximum percentage of the observed data, which will cause the import tax of the two products higher. In fact, the estimation is always made with the highest rate possible to mitigate the risk of losing money if the import tax rate may increase.

6 Pricing method

Recalling the knowledge of pricing in the theory chapter, the cost-plus pricing method is popularly used in organizations because the method is simple and its implementation is cost efficient. Further, the cost-plus pricing method requires the cost base and the mark-up percentage to formulate the price. This chapter employs the calculations in the last chapter to calculate the cost bases of critical products. Then, the cost bases are used to calculate the markup percentage figures. The pricing method of critical products is afterwards established as the final purpose of the chapter.

6.1 Cost base

The product cost base can be determined optionally. For example, it might be the manufacturing cost or full cost of a product. As the direct variable costs have considerable impacts on the critical products, it is logical to select the sum of direct variable costs as the cost base. The cost base calculations of critical products are illustrated in Table 19.

Table 19. Cost bases of critical products

Product	Year	Weighted Average Purchasing Price* (VND/kg)	Weighted Average Freight Cost* (VND/kg)	Weighted Average Service Cost* (VND/kg)	Weighted Average Import Tax* (VND/kg)	Cost Base (VND/kg)
		$\bar{p}$	$\bar{f}$	$\bar{s}$	$\bar{it}$	C_b
Blanched Sliced Almond	2009	113,389	1,633	1,562	12,443	129,027
	2010	117,327	1,305	981	13,286	132,899
	2011	133,973	923	707	14,392	149,995
Powder Almonds	2009	118,900	1,618	1,380	3,196	125,094
	2010	110,783	2,087	992	-	113,862
	2011	136,198	884	667	14,765	152,514
Walnut	2009	103,911	1,662	1,958	5,299	112,830
	2010	179,801	1,311	1,321	563	182,996
	2011	228,828	1,049	825	-	230,702
Macadamia 1	2009	240,605	1,677	1,899	80,775	324,956
	2010	337,961	2,601	3,249	103,158	446,969
	2011	437,927	2,678	3,412	132,863	576,880
Prunes	2009	74,138	1,644	1,971	24,950	102,703
	2010	69,311	1,600	1,749	21,079	93,739
	2011	93,649	1,770	1,639	28,411	125,469

Note

*: Round figures

The table displays items including the weighted average purchasing price, the weighted average freight cost, the weighted average service cost, the weighted average import tax and the cost base. That allows analytical as well as straightforward comparisons of the product cost elements in the same years and in different years.

6.2 Markup percentage

The product price is known data (Table 20), which enables to compute the markup percentages. The markup percentage is calculated using following formula:

$$m = \frac{P_s - C_b}{C_b} \times 100 \quad (15)$$

where:

P_s = the selling price of a product (VND)

C_b = the cost base of a product quantity (VND)

m = the markup percentage of a product of a year (%)

Table 20. Selling prices (VND/kg) of critical products (2009–2011)

Product Selling Prices (VND/kg)					
Year	Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
2009	210,000	210,000	205,000	450,000	160,000
2010	230,000	200,000	280,000	600,000	190,000
2011	225,000	215,000	375,000	770,000	200,000

Using formula (15), the study calculated the markups of critical products (Table 21).

Table 21. Markup percentage of critical products (2009–2011)

Products	Year	Cost base (VND/kg) C_b	Selling Price (VND/kg) P_s	Markup* (%) m	Average*
Blanched Sliced Almond	2009	129,027	210,000	62.76%	61.94%
	2010	132,899	230,000	73.06%	
	2011	149,995	225,000	50.01%	
Powder Almonds	2009	125,094	210,000	67.87%	61.50%
	2010	113,862	200,000	75.65%	
	2011	152,514	215,000	40.97%	
Walnut	2009	112,830	205,000	81.69%	65.75%
	2010	182,996	280,000	53.01%	
	2011	230,702	375,000	62.55%	
Macadamia 1	2009	324,956	450,000	38.48%	35.40%
	2010	446,969	600,000	34.24%	
	2011	576,880	770,000	33.48%	
Prunes	2009	102,703	160,000	55.79%	72.63%
	2010	93,739	190,000	102.69%	
	2011	125,469	200,000	59.40%	

Note

*: Round figures

The study makes the example of markup calculation of Blanched Sliced Almond in 2009 to show how the results are obtained. The markup of Blanched Sliced Almond is acquired as follows:

$$m_{B.S.A./2009} = \frac{P_{s/2009} - C_{b/2009}}{C_{b/2009}} \times 100 = \frac{210{,}000 - 129{,}027}{129{,}027} \times 100$$

$$= \frac{80{,}093}{129{,}027} \times 100 \approx 62.76\%$$

The results of the table indicate that both cost base and selling price of products have gone up throughout three years. The augmentation of the cost base will lead to the increase of the selling price. However, the product selling price often raised less than or even dropped compared with the product cost because the case company has to keep the price competitively in the market. To evaluate the product markup, their average figures can be used to estimate the markup for each product. Accordingly, the markup numbers are 62 percent (Blanched Sliced Almond and Powder Almonds), 66 percent (Walnut), 36 percent (Macadamia 1) and 73 percent (Prunes).

6.3 Cost-plus pricing method

The section shows a way to construct the critical product prices by employing all the findings that are estimations in the previous parts. The comprehensive calculations of prices of critical products of 2012 are illustrated as the demonstration of the developed cost-plus pricing method. Several assumptions will be made to facilitate the calculations and may not represent the real situations of the case company. However, the main idea is not to emphasize the accuracy of calculations but to highlight the method that is used to form the product prices. The method includes five steps as follows:

Step 1: Determining the product purchasing price (USD/kg)

The purchasing price analysis (Chapter 5.2.2) suggests the way of estimating the product purchasing price (USD/kg) by using the average price (USD/kg) of three-year period from 2009 till 2011. In addition, the standard deviation in percentage is used as the estimation error (Table 22).

Table 22. Purchasing prices (USD/kg) of critical products in 2012

Step 1	Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
Average Purchasing Price (USD/kg)	6.73	6.91	8.58	17.42	4.23
Adjusted Error (%)	9%	20%	29%	18%	13%
Purchasing Price 2012* (USD/kg)	**7.34**	**8.29**	**11.07**	**20.56**	**4.78**

Note

*: Round figures

The product purchasing prices is calculated by increasing the average purchasing price by the adjusted error percent. For instance, the purchasing price 2012 (USD/kg) of Blanched Sliced Almond is computed as follows:

$$\text{Purchasing Price 2012 (USD/kg)}_{\text{B.S.A.}} = 6.73 \times (1 + 9\%) \approx 7.34 \text{ (USD/kg)}$$

Step 2: Determining the exchange rate (USD/VND)

After finding the purchasing prices of products, the second step is to determine the exchange rate (USD/VND). As presented in the purchasing price analysis (Section 5.2.2) , the exchange rate is estimated based on the figures of 2011. The adjustment is made to avoid the inaccuracy of the estimation. (Table 23.)

Table 23. The exchange rate of 2012

Step 2	Determining the exchange rate
Average Exchange Rate 2011* (USD/VND)	20,163
Change (%)	9%
Adjusted Error (%)	5%
The Exchange Rate 2012* (USD/VND)	22,986

Note

*: Round figures

The exchange rate of 2012 is thought nine percent higher than the average exchange rate 2011. Furthermore, five percent is added to mitigate the exchange rate fluctuation. (Section 5.2.2.) Accordingly, the exchange rate of 2012 (USD/VND) is obtained as follows:

$$\text{The exchange rate 2012 (USD/VND)} = 20{,}163 \times (1 + 9\% + 5\%) \approx 22{,}986$$

Step 3: Calculating the product purchasing price (VND/kg)

The next step is to calculate the product purchasing price (VND/kg). The purchasing price (VND/kg) of 2012 is obtained by multiplying the purchasing price (USD/kg) and the exchange rate (USD/VND) (Table 24).

Table 24. Purchasing prices (VND/kg) of critical products in 2012

Step 3	Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
Purchasing Price 2012* (USD/kg)	7.34	8.29	11.07	20.56	4.78
The Exchange Rate 2012* (USD/VND)	22,986				
Purchasing Price 2012* (VND/kg)	168,717	190,554	254,455	472,592	109,873

Note

*: Round figures

Based on the table, the purchasing price 2012 (VND/kg) of the Blanched Sliced Almond is acquired from the following computation:

$$\text{Purchasing Price 2012 (VND/kg)}_{\text{B.S.A.}} = 7.34 \times 22{,}986 \approx 168{,}717 \text{ (VND/kg)}$$

Step 4: Constructing the cost base (VND/kg)

Then, the cost base (VND/kg) is constructed using the mathematical expressions between purchasing price and costs such as freight cost, import tax and service costs, which are developed in the previous chapter. Accordingly, the freight cost and the service cost is estimated as two percent of the purchasing price (Section 5.3.2; Section 5.4.2). The import tax rates are 11 percent (Blanched Sliced Almond and Powder Almonds), 5 percent (Walnut) and 32 percent (Macadamia 1 and Prunes) (Section 5.5.2). The cost bases of critical product in 2012 are found (Table 25).

Table 25. Cost bases (VND/kg) of critical products in 2012

Step 4	Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
Purchasing Price 2012* (VND/kg)	168,717	190,554	254,455	472,592	109,873
Freight Cost (VND/kg)	2%	2%	2%	2%	2%
Service Cost (VND/kg)	2%	2%	2%	2%	2%
Import Tax (VND/kg)	11%	11%	5%	32%	32%
Cost Base 2012* (VND/kg)	**194,025**	**219,137**	**277,356**	**642,725**	**149,427**

Note

*: Round figures

The cost base of each product is the sum of purchasing price and all the direct variable costs that are expressed in percentage of the purchasing price. To demonstrate the

calculation, the cost base 2012 (VND/kg) of Blanched Sliced Almond is shown as follows:

$$\text{Cost base 2012 (VND/kg)}_{\textbf{B.S.A.}} = 168{,}717 \times (1 + 2\% + 2\% + 11\%)$$
$$\approx 194{,}025 \text{ (VND/kg)}$$

Step 5: Formulating the selling price (VND/kg) by adding the markup

In the final step, the markup percentage is attached to the cost base (VND/kg) to create the product selling price (VND/kg) of 2012 (Section 6.2). The adjustment is made to make the selling price tradable, which refers to the ease of currency trading. The smallest currency unit of 1,000 is utilized. (Table 26.)

Table 26. Selling price (VND/kg) of critical products in 2012

Step 5	Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
Cost Base 2012* (VND/kg)	194,025	219,137	277,356	642,725	149,427
Markup (%)	62%	62%	66%	36%	73%
Selling Price 2012* (VND/kg)	314,321	355,002	460,411	874,106	258,509
Adjusted Selling Price 2012* (VND/kg)	315,000	355,000	461,000	875,000	259,000

Note

*: Round figures

The final selling price 2012 (VND/kg) of Blanched Sliced Almond is demonstrated in the following calculation:

$$\text{Selling Price 2012 (VND/kg)}_{\textbf{B.S.A.}} = 194{,}025 \times (1 + 62\%) \approx 314{,}321 \text{ (VND/kg)}$$

7 Demand forecasts

The chapter tackles partly the inventory management of critical products by forecasting the customer demand. The demand of customers is measured by the customer orders. As the customers of the case company request products by weight; the customer orders are represented as the sales volume in kilo. Therefore, the case company can foresee the demand of critical products by predicting their sales volumes. Using historical data of sales volumes of critical products, the study attempts to forecast the critical product sales volumes of 2012. The forecasting procedure of Blanched Sliced Almond is elaborated in the chapter as the demonstration of calculation that is applied consistently with the others.

7.1 Linear regression formula

The future sales volume of Blanched Sliced Almond is estimated based on the linear regression forecasting method. The data of sales volume of the product is presented in Table 27.

Table 27. Sales volume of Blanched Sliced Almond (2009–2011)

Time Series			Blanched Sliced Almond		
Year	Quarter	Period	Sales Volume* (kg)	xy	x^2
		x	y		
2009	1	1	309	309	1
	2	2	400	800	4
	3	3	834	2,502	9
	4	4	1,120	4,480	16
2010	1	5	1,341	6,705	25
	2	6	1,485	8,910	36
	3	7	1,624	11,368	49
	4	8	2,269	18,152	64
2011	1	9	1,776	15,984	81
	2	10	2,576	25,760	100
	3	11	2,509	27,599	121
	4	12	3,035	36,420	144
Total		78	19,278	158,989	650
Average		6.50	1,606.50		

Note

*: Round figures

According to the theory of linear regression forecasting (Section 3.3.3), the estimated slope coefficient $\hat{a}$ and estimated intercept term $\hat{b}$ of the formula are computed respectively in the below formulas:

$$\hat{a} = \frac{\sum_{i=1}^{n} x_i y_i - \frac{(\sum_{i=1}^{n} x_i)(\sum_{i=1}^{n} y_i)}{n}}{\sum_{i=1}^{n} x_i^2 - \frac{(\sum_{i=1}^{n} x_i)^2}{n}}$$

$$= \frac{158{,}989 - \frac{78 \times 19{,}278}{12}}{650 - \frac{78^2}{12}} = \frac{158{,}989 - 125{,}307}{650 - 507} \approx 235.54$$

and

$$\hat{b} = \bar{y} - \hat{a}\bar{x}$$

$$= 1{,}606.50 - 235.54 \times 6.50 = 75.49$$

The linear regression formula of Blanched Sliced Almond is, accordingly, is obtained as follows:

$$\hat{y} = \hat{a}x + \hat{b}$$
$$= 235.54 \times x + 75.49$$

Since the estimated slope of coefficient is positive, the regression forecast demand of Blanched Sliced Almond increases from period to period. The regression forecast of Blanched Sliced Almond for corresponding periods are presented in Table 28. The linear regression formulas and the regression forecasts of all products are shown in Attachment 11.

Table 28. Regression forecast of Blanched Sliced Almond (2009–2011)

Time Series			Blanched Sliced Almond	
Year	Quarter	Period	Sales Volume* (kg)	Regression Forecast (kg)
		x	y	$\hat{y}$
2009	1	1	309	311.03
	2	2	400	546.57
	3	3	834	782.11
	4	4	1,120	1,017.65
2010	1	5	1,341	1,253.19
	2	6	1,485	1,488.73
	3	7	1,624	1,724.27
	4	8	2,269	1,959.81
2011	1	9	1,776	2,195.35
	2	10	2,576	2,430.89
	3	11	2,509	2,666.43
	4	12	3,035	2,901.97

Note

*: Round figures

The graph was drawn to give the visual view of the comparison between the real sales volume and the regression forecast sales volume (figure 7).

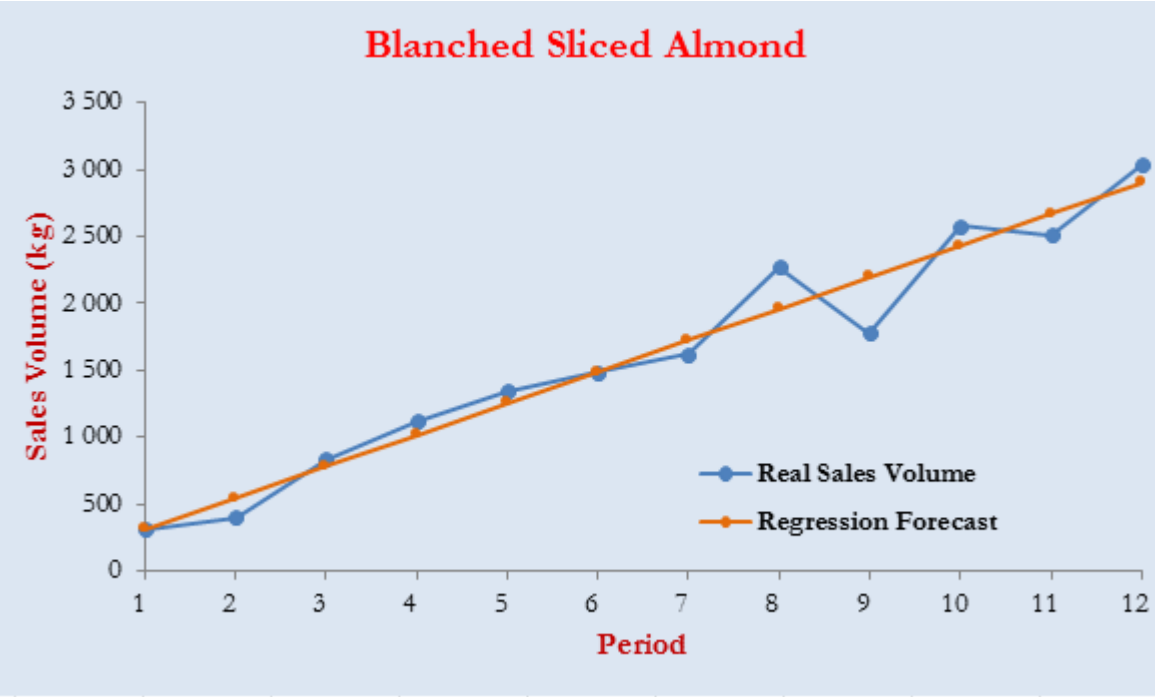

Figure 7. Real demand and regression forecast of Blanched Sliced Almond

According to the above figure, the real sales volume strongly reflects the linear regression relationship between the time period and the demand. Thus, the regression forecast sales volume line is said to illustrate closely the real sales volume. In order to see the seasonality of the product, another graph is constructed (figure 8).

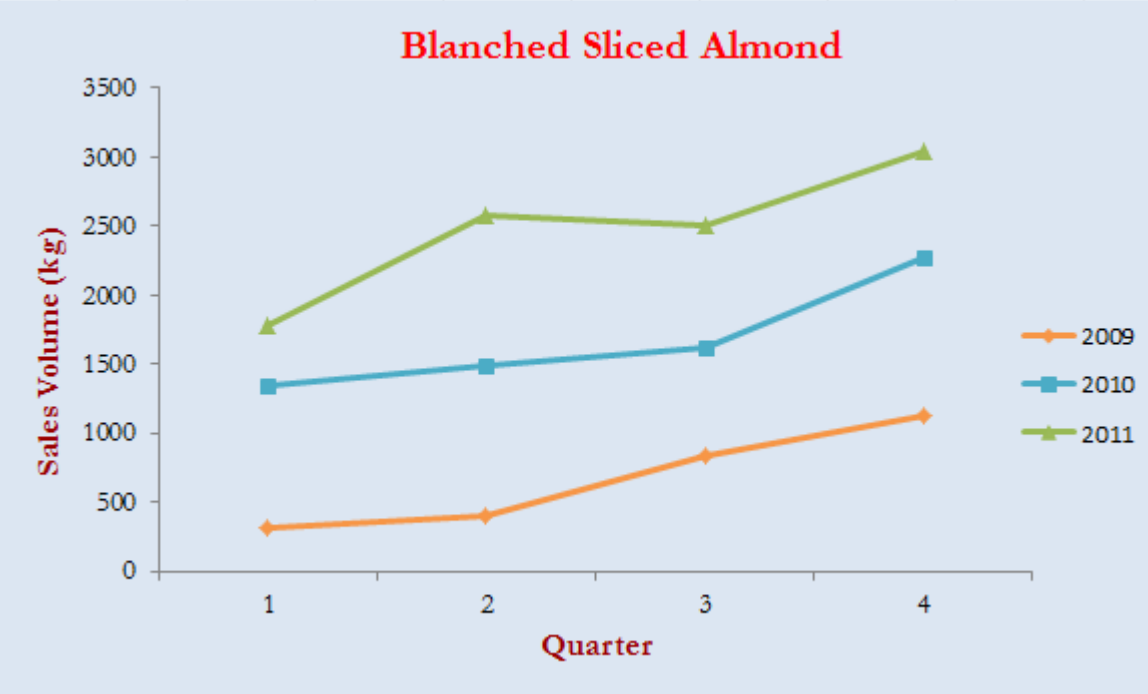

Figure 8. Seasonality of Blanched Sliced Almond

The graph really shows the strong existence of the product seasonal factor. The demand of Blanched Sliced Almond goes up from years to year and peaks at every fourth quarter. The formula expressed the trend and randomness of the product but did not demonstrate its seasonality. Therefore, the seasonal adjustments are needed to result in the more accurate forecasting method.

7.2 Seasonal adjustment

The ratio of the sales volume to the regression forecast numbers is computed to measure the errors of the forecasting (Table 29). If the ratio is less than one, the forecast is said over-forecasting. On the other hand, if the ratio is larger than one, the forecast is under-forecasted. The forecast is flawless if the ratio equals to one, which rarely occurs in practice. (Section 3.3.3.) If the ratio is close to one, the forecast is possibly considered as accurate.

Table 29. Adjusted regression forecast of Blanched Sliced Almond (2009–2011)

Time Series			Blanched Sliced Almond				
Year	Quarter	Period	Sales Volume* (kg)	Regression Forecast (kg)	Ratio*	Sesonal Index	Adjusted Regression Forecast* (kg)
		x	y	$\hat{y}$	$(y/\hat{y})$		
2009	1	1	309	311.03	0.993	0.957	298
	2	2	400	546.57	0.732	0.930	508
	3	3	834	782.11	1.066	0.983	769
	4	4	1,120	1,017.65	1.101	1.102	1,121
2010	1	5	1,341	1,253.19	1.070	0.957	1,199
	2	6	1,485	1,488.73	0.997	0.930	1,385
	3	7	1,624	1,724.27	0.942	0.983	1,695
	4	8	2,269	1,959.81	1.158	1.102	2,160
2011	1	9	1,776	2,195.35	0.809	0.957	2,101
	2	10	2,576	2,430.89	1.060	0.930	2,261
	3	11	2,509	2,666.43	0.941	0.983	2,621
	4	12	3,035	2,901.97	1.046	1.102	3,198

Note

*: Round figures

The ratios of the same quarter in each year are averaged to create the seasonal index of that quarter. For instance, the seasonal index of the first quarter of Blanched Sliced Almond is calculated as follows:

$$\text{Seasonal Index}_{Q1} = \frac{\text{Ratio}_{Q1/2009} + \text{Ratio}_{Q1/2010} + \text{Ratio}_{Q1/2011}}{3}$$
$$= \frac{0.993 + 1.070 + 0.809}{3} \approx 0.957$$

The adjusted regression forecast is calculated by multiplying the regression forecast by the seasonal index. The effect of seasonal adjustment is illustrated by plotting the sales volume, the regression forecast and the adjusted regression forecast in the same graph (figure 9).

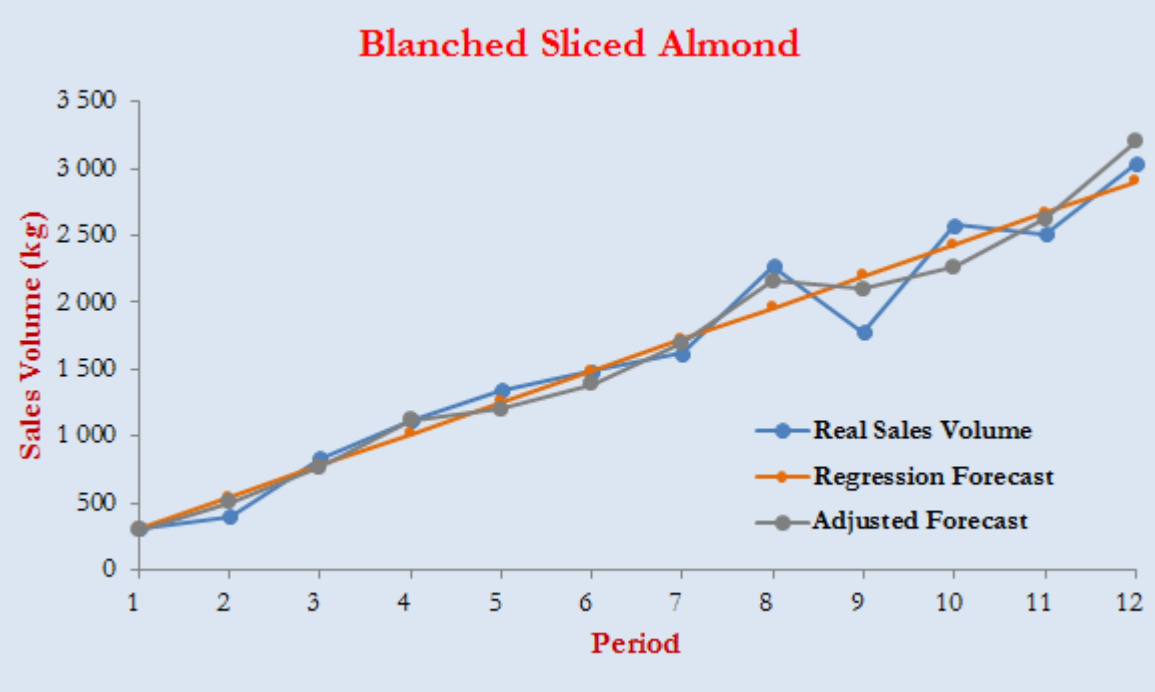

Figure 9. Seasonal adjustment effect of Blanched Sliced Almond

The graph showed that the seasonal index transformed the regression forecast line to the adjusted forecast line, which simulates the real sales volume line with very high accuracy. That proves the correctness of the need to execute seasonal adjustment. The

seasonal adjustments are performed for all critical products and their effects can be seen in Attachment 11.

7.3 Forecast accuracy

The section assesses the constructed model in terms of the accuracy. The forecast errors are measurable by instruments mentioned in the theory (Section 3.3.4). The forecast errors of Blanched Sliced Almond are calculated in Table 30.

Table 30. Forecast accuracy of Blanched Sliced Almond (2009–2011)

Time Series			Blanched Sliced Almond			
Year	Quarter	Period	Sales Volume* (kg)	Adjusted Regression Forecast* (kg)	Forecast Error	Absolute Deviation
		x, i	y		FE_i	$\lvert FE_i \rvert$
2009	1	1	309	298	11	11
	2	2	400	508	-108	108
	3	3	834	769	65	65
	4	4	1,120	1,121	-1	1
2010	1	5	1,341	1,199	142	142
	2	6	1,485	1,385	100	100
	3	7	1,624	1,695	-71	71
	4	8	2,269	2,160	109	109
2011	1	9	1,776	2,101	-325	325
	2	10	2,576	2,261	315	315
	3	11	2,509	2,621	-112	112
	4	12	3,035	3,198	-163	163
Total					-38	1,522
Mean forecast error (*MFE*)			-3.17			
Mean absolute deviation (*MAD*)			126.83			

Note

*: Round figures

Forecast error (*FE*) is taken as the difference between actual value and forecasted value. The mean forecast error (*MFE*) and mean absolute deviation (*MAD*) are computed respectively as follows:

Mean forecast error $(MFE) = \frac{\sum_{i=1}^{n} FE_i}{n} = \frac{-38}{12} \approx -3.17$

Mean absolute deviation $(MAD) = \frac{\sum_{i=1}^{n} |FE_i|}{n} = \frac{1,522}{12} \approx 126.83$

In the same manner, the *MFE* and *MAD* of critical products are found (Attachment 11). The collation of the figures is presented to evaluate the accuracy of the forecast method (Table 31).

Table 31. Forecast accuracy of critical products

Products	Mean forecast error (*MFE*)*	Mean absolute deviation (*MAD*)*
Blanched Sliced Almond	-3.17	126.83
Powder Almonds	4.42	152.75
Walnut	-125.67	196.50
Macadamia 1	-0.33	15.83
Prunes	-1.75	34.25

Note

*: Round figures

According to the theory, the Powder Almonds in average under-forecasted the demand as its *MFE* is positive while the other products are over-forecasting because of having the negative *MFE* figures. Most of the products have small *MFE* numbers falling to the range of [-5, 5], which indicate the fairly unbiased of the forecasting model. Walnut is exceptional while its model is extremely over-forecasting with the *MFE* of about minus 126. The forecast model results for most of products rather large *MAD* measures which indicate the average size of errors of the forecasting model. The forecasts for Blanched Sliced Almond, Powder Almonds and Walnut have errors between 100 to 200 kilos. In spite of having large *MAD* figures, the forecasts of

Blanched Sliced Almond and Walnut are considered safe because the model anticipate more demands than the actual practice, which will lead to more stocks are stored in the warehouse. Since the goods are dried fruits and nuts, which are not perishable, keeping more stocks is not a big problem. For the case company, over-forecasting is better than under-forecasting. The forecasting of Powder Almonds is problematic as it is under-forecasted and may require more modification after applying the model. Estimates of the demand of Macadamia 1 and Prunes are relatively accurate.

7.4 Final forecasts

The linear regression formula and the seasonal adjustments provide the basis for estimating the future demand of 2012 or in other word the sales volume of 2012. At the time the study started, the case company had already finished the first quarter of 2012. It may be considered as irrelevant to make the forecasts of critical products in the first quarter of 2012. Nevertheless, the forecast is still undertaken to show how the forecasting method is applied in practice. The year 2012 corresponds to the period number from 13 to 16. Therefore, the sale volumes forecast of critical products is made from 13th period to 16th period (Table 32).

Table 32. Sales volume forecasts of critical product in 2012

Products	Time Series			Regression Forecast (kg)	Sesonal Index	Adjusted Regression Forecast* (kg)
	Year	Quarter	Period x			
Blanched Sliced Almond	2012	1	13	3,137.51	0.957	3,003
		2	14	3,373.05	0.930	3,137
		3	15	3,608.59	0.983	3,547
		4	16	3,844.13	1.102	4,236
Powder Almonds	2012	1	13	1,844.75	0.769	1,419
		2	14	1,976.25	0.926	1,830
		3	15	2,107.75	0.963	2,030
		4	16	2,239.25	1.230	2,754
Walnut	2012	1	13	1,272.08	0.260	331
		2	14	1,386.67	1.773	2,459
		3	15	1,501.26	1.674	2,513
		4	16	1,615.85	0.999	1,614
Macadamia 1	2012	1	13	181.74	1.391	253
		2	14	193.88	0.719	139
		3	15	206.02	0.747	154
		4	16	218.16	1.193	260
Prunes	2012	1	13	439.54	1.094	481
		2	14	467.29	0.725	339
		3	15	495.04	0.829	410
		4	16	522.79	1.336	698

Note

*: Round figures

8 Discussion

The data analyses discovered several findings that may bring valuable insights to help with developing the business management of the case company. No matter how carefully the analyses are performed, their results are needed to evaluate in terms of reliability and validity.

Reliability assesses if a measuring instrument yields the same results on repeated trials (Adam et al. 2007, 235). The main idea is about the consistency of the measuring process. If the outcome of the measuring instrument is reproducible under certain conditions, the instrument is said reliable. In other words, reliability indicates the inerratic and predictable results when performing the instrument. This can lead to an odd situation. For example, the instrument may measure the variable incorrectly but as long as the measuring procedure is consistently carried out wrongly, the instrument is still considered reliable. **Validity**, therefore, is needed to verify the accuracy of the instrument (Adam et al. 2007, 237). Validity is viewed as more important than reliability since if the instrument yields incorrect results, it is irrelevant regardless of its consistent measuring.

The chapter is the heart of the paper when discussing the study findings, which are the critical products, the pricing method and the demand forecasting method, in terms of results interpretation, reliability and validity. The discussion also points out the benefits of the study for several relevant groups. Subsequently, some drawbacks of the study are mentioned as the limitations of the study, which lead to the recommendations for further studies and developments.

8.1 Critical products

The 80/20 Principle provides a basis to identify the critical products using the 80/20 Analysis. There are five products, aggregating about 30 percent of total selected products (5/17), make up 70 to 75 percent of the total sales. The result creates either the 70/30 or the 75/30 relationship between the total sales and the critical products, which slightly differ from what the 80/20 Principle would predict. Nonetheless, the

main tenet of the principle is maintained as the pattern of imbalance of causes and effects is verified. Indeed, a small number of products have been contributing to the major sale of the case company.

The 80/20 Principle is quite powerful and reliable to find important causes or factors among trivial things. This is attested by running the 80/20 Analysis of the three-year data and the results of product analysis are consistent and reflect exactly what mentioned in the theory. Consequently, the identified products are believed crucial. The case company manager also agrees with the findings, which validates the principle accuracy.

8.2 Pricing method

By calculating the markup percentage of critical products (Table 21), the study realized that the markups of most products have varied considerably except for Macadamia 1. The substantial discrepancies imply an underlying assumption – the case company either has used cost-plus pricing method with different cost bases or has employed another pricing method to make the product prices. The latter assumption seemed to be illogical because if the case company had not been utilizing the cost-plus pricing method, the markups of Macadamia 1 during three years would not yield such close figures. The results are not assumed to be coincidental. The case company has probably used the cost-plus method to price their products but with a different way of calculating the cost base.

The study faced a quandary whether to continue to develop a cost-plus pricing method since the company already had one. Nevertheless, the current pricing practice was supposedly unsystematic as it created the big differences of markups numbers, which rarely occur in a systematic method. The section will discuss both the current pricing practice and the developed pricing method to highlight the advantages of study findings.

8.2.1 The current practice

At the time the study deduced that maybe the case company has already used the cost-plus method, a discussion with the company manager took place to clarify the situation. The manager was surprised at the inference of the study and provided more information on the pricing practice. The case company has priced their product based on the information of every shipment. More specifically, the purchasing value of a shipment is obtained and all the freight cost, the service cost and the import tax are then estimated as one cost pool, for example, 15 percent of the purchasing value. The cost pool is then traced to the shipment quantity to get the cost per kilo. Afterwards, the case company adds the purchasing price and the cost per kilo to form the cost base to which the markup percentages are added to form the product selling prices. The percentage figures were undisclosed because of confidentiality.

The information provided by the manager confirmed the study's inference about the exercising of cost-plus pricing method in the case company business. The current method is seemingly similar to the developed method; especially the current one also considers the same direct variable costs as the study does. However, the two methods are totally different. Firstly, the current method does not track in detail the freight cost, the service cost and the import tax of critical products. That enables the current method to calculate the selling prices faster as it does not require detail information of the direct variable costs. Secondly, the current method takes into account all other unimportant product and the results of cost bases were misleading. Finally, the estimations of the current method are derived from the case company's experiences not from the historical data, which may not reflect the true practice.

8.2.2 The developed method

The developed five-step method illustrates how to price the critical products systematically. The study emphasizes on creating the commonly used and systematic method for pricing products, not on finding the markup percentages of products. The judgment, therefore, must be made solely to evaluate if the method is capable to

calculate the product prices systematically and if the method is superior to the current pricing practice of the case company.

Apparently, the markup pricing method is applicable only if the cost base is identified. Hence, the reliability of the cost base finding is vital to establish the good selling prices. Cost base is constructed by utilizing the mathematical expressions between the purchasing price and other direct variable costs. This is the backbone of the whole method, which presumed that there has been a fair mathematic estimation between the purchasing price and other costs. The recent three-year data proved that the freight cost, the import tax and the service cost could be almost expressed as percentages of the purchasing price with small divergence. Accordingly, the presumption was almost substantiated and can be accepted. That implied the coherence and correctness of the methods and formulas being used to establish the mathematical expressions. However, the methods and formulas may be questionable as import taxes of Powder Almonds and Walnut could not be linked reliably with their purchasing prices (Table 18). This happened because of one objective reason – the volatility of the import tax rate. In other words, considerable differences in the results of Powder Almonds and Walnut were caused by the big variations of their data not by the methods or formulas (Attachment 10). Comparably, the import taxes of products having more stable import tax rate yield approximately equal percentage numbers of their purchasing prices (Attachment 10, Table 18). Thus, the cost base is entirely possibly calculated with high reliability and accuracy unless huge changes might occur.

The pricing method being developed takes the cost base and adds up the markup amount to acquire the selling price. Since the cost base is obtained reasonably, the accurate price is easily calculated with an appropriately chosen markup component. The method creates the systematic way to make prices not only for critical import products but also for all import products of the case company. Indeed, the prices can be made via the homogenous five-step procedure. Furthermore, the simplicity of the method lowers errors and increases the accuracy of the calculations. Although the method uses estimative percentages in calculating product prices, the estimations are derived from the past data, which reflects the cost behaviors and the propensity of cost

movement. The prices are made accordingly with the cost developments. Consequently, all deductions present the reliability and validity of the method as long as it is executed under the study assumptions.

The study developed the pricing method that solved some disadvantages of the current one such as unsystematic property and inaccurate calculations of the direct variable costs. All the case company has to do is to establish a tracking system of the direct variable costs, which may consume an amount of the case company resources.

8.3 Forecasting model

The model analyzed the past sales data to establish the linear regression formulas with seasonal adjustments of critical products. Since the historical sales data contains underlying insights of how customers have demanded the critical products during the last three years, the reliable forecasting method is feasible to create. The linear regression method and seasonal adjustment were combined to construct the forecasting model, which facilitates the prediction of future demands of critical products. The forecasting model was tested by plotting both the adjusted regression forecasts and real results in the graphs for comparison (Attachment 11). Amazingly, the model depicted the historical sales pattern fairly accurately, which indicates that a pattern of demand really exists and it is predictable. Accordingly, the model can anticipate the future demand rather reliably. The accuracy of the model is verified using the case company's old data. The model either predicts fairly well the demands of Macadamia 1 and Prunes or is considered safe by over-forecasting the demands of Blanched Sliced Almond and Walnut. There is seemingly a doubt about the accuracy of the model because Powder Almonds may need more modifications. However, the model also signaled the problems of Powder Almonds forecasts for the company to consider when making a final decision. Consequently, the model is a reasonable tool to anticipate the demands of critical products.

8.4 Limitations

During the research procedure, multiple challenges have been recognized and confronted. However, the study is incapable of handling all of them and some unsolved issues are seen as the drawbacks of this paper. The problems include imprecise future estimations of elements such as the purchasing price, the exchange rate and the markup percentage as well as the debatable understanding of the customer demand. The section will discuss all these disadvantages one by one.

Firstly, product purchasing prices (USD/kg) of 2012 were taken as average numbers of the past data, which seems inappropriate in practice. The case company and suppliers make contracts according to which the product prices are determined. That fixes the prices in a certain period. Afterwards, the prices may be altered under provisions of the contracts, by signing new contracts or by oral agreements between the two parties. Additionally, suppliers occasionally offer good prices that are seen as the results of competitive pressures, the reward for loyalty or for the other reasons. The price changes are consequently predictable and do not depend on historical data. . In practice, the company always knows beforehand or is able to anticipate with high accuracy the product prices. The analysis of the old data brought back only facts that do not support the price forecasting of critical products. Instead, identifying the purchasing prices requires a different approach that employs the experiences and insights of the case company manager. Information of the know-how is inaccessible and the study left it open.

Secondly, the estimate of the exchange rate of 2012 is inaccurate. Unlike the purchasing price, the exchange rate is one of the macroeconomic matters, which is highly stable. The changing of exchange rate, therefore, is predictable. The study utilized the exchange rate data which was recorded every shipment by the case company to make the forecast of the exchange rate of 2012. The fact that sporadic shipments capture the irregular exchange rate figures created a problem. The data did not reflect the real exchange rate fluctuation that occurs daily not occasionally. To attain a better exchange rate estimate of the year 2012, the daily exchange rate data of

three-year period from 2009 till 2011should have been analyzed rather than using the company data. The ideal data is the daily three-year interbank exchange rate data, which can only be obtained from banks. Analyzing this data not only consumes time resource heavily but also requires a lot of efforts to collect the data, which might be inaccessible due to confidentiality. Furthermore, doing that seems unnecessary since the company with several years of experience has probably managed the exchange rate reasonably. Even a hedging method was possibly developed to mitigate the exchange rate risk.

Thirdly, the product markups of 2012 are taken as the average percentage of the markup analysis (Table 21). The numbers are seemingly unreliable as the past markups deviate considerably. There are no grounds to explain why the selected figures are appropriate. Although the study focuses on how to price a product rather than on finding the accurate product markups, a need for a precise calculation method of product markups is also demanded. Indeed, the markup component is not a rigid number but rather erratic and flexible. In addition, choosing a reasonable markup is quite complex matter and depends on multiple factors such as the competitive price, the company's rate of return and the customers. These elements are either difficult to tackle because of unavailable information such as competitors' product prices or beyond the study capability with more perceptions required, for instance, customer behaviors analysis or internal rate of return. Therefore, the question of how to acquire applicable markup percentages of critical products has been unsolved.

Finally, the study unified the customer demand and the sales volume as one thing but they are slightly different. Although the sales volume reflects the demand of customers but it is not the customer demand. The difference between them is explicated in the following example. In January customers may want to buy 100 kilos of Walnut in total, the case company however does not have any stock of the product in its warehouse. The customers have to go to another seller to buy Walnut instead of waiting for the case company to import the product. Thus, the sales volume of Walnut in January is zero while the customer demand of the product of the period is 100 kilos. The demand should be measured as the need of customers for products regardless of whether the

company capability to supply the products. The information is not recorded by the case company, which prevents a more accurate demand analysis.

8.5 Benefits for stakeholders

Despite of having some limitations, the study is still beneficial for several parties including the case company, the students and the author.

Firstly, the case company can apply the 80/20 Principle in different situations to sort out the significant and insignificant elements or reuse it with the future data to identify new critical import products. The pricing method can be used as reference to review the current pricing practice, to optimize product pricing or to respond to changes of cost factors more appropriately. The forecasting method will certainly help in a certain degree with the purchasing procedure and facilitates the inventory management. The study also hopes to bring back new insights or new ideas for the case company to operate the business more efficiently.

Secondly, the study may provide a tool for the students when having a need to select important factors out of many trivial things. Some knowledge and information from the study may help with learning or conducting researches about cost management in pricing, demand forecasting as well as import practices in Vietnam. It is expected that by reading the study, students may generate ideas for their topic theses or cite the study findings when writing their papers.

Finally, the study fostered the author to learn more knowledge regarding cost management, inventory management and import practices in Vietnam. The awareness of differences between the theory and practice is developed clearly after the research. The study also assists the author not only in improving the writing and citation skills but also in developing for himself his own working methods in terms of data collection, data analysis and planning.

8.6 Recommendations

The section suggests some recommendations which are thought useful for both the case company and the academic development.

For the case company, there are few notable points that should be considered carefully when employing the study findings, especially the pricing method and the demand forecasting model. Firstly, the case company should develop a tracking system of direct variable costs to make use of the pricing method. By using a spreadsheets application such as MS Excel or Apache OpenOffice Calc, the case company is absolutely able to create the system with ease. Secondly, the analyses of direct variable costs should be encouragingly carried out in more frequently shorter period, for example every quarter or every six months compared with three years performed in the study. The analyses will makes the results more stable since changes take place slightly during a short term. Thirdly, the exchange rate estimate should be selected carefully to mitigate the risk of fluctuation. Fourthly, the case company should use the markup percentage propositions in the study cautiously. It is better that the case company combines both its pricing experiences and the study findings to determine the most appropriate markup components of critical products. Finally, the case company should come closer to the customers either to obtain more valuable information for better forecasting or even to develop a collaborative demand forecasting model.

Apprehending concurrent limited capabilities, the study makes several suggestions for further researches in the same or related topics. Firstly, the 80/20 Principle was certified valid in this study. However, more empirical evidences should be undertaken to validate as well as to challenge the correctness of the principle. Secondly, although analyzing the exchange rate using the ideal data of banks is effortful, the results will expectedly open up formidable discoveries. Thus, the analysis is strongly recommended. Thirdly, the question of how to pick appropriate markup percentage numbers for critical products can be tackled partially by conducting a cost-volume-profit analysis. The analysis will reveal the breakeven points that are helpful for markup percentages decisions. The analyses of competitors and customer behaviors are also

encouraged to cover all influential factors in pricing practice. Fourthly, there are numerous available pricing approaches that may be vastly superior to the cost-plus pricing method. Researchers may feel interested in developing or comparing different alternative pricing methods to have better understandings of the pricing tactic. Finally, the study only exploits the power of linear regression forecasting method, which may be not the best one. Hence, the same suggestion for pricing approach also applies for forecasting methods. The study enthusiastically proposes researching different forecasting methods.

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Attachments

Attachment 1. Overlay matrix

Research Problem: The analysis of costs and demand of critical import products to develop a product pricing method and a demand forecasting model for small and medium enterprises (SMEs) specializing in import in Vietnam		
Investigative questions	**Theoretical framework**	**Results and findings**
IQ1: What are critical import products of the company?	3.1	4.3
IQ2: What are crucial costs of each critical import product?	3.2.1, 3.2.2	5.1
IQ3: How to compute crucial costs per kilo for each product?	3.2.1, 3.2.2	5.2, 5.3, 5.4, 5.5
IQ4: What are cost-plus pricing structures of each critical import product?	3.2.3	6.1, 6.2
IQ5: How to price each critical import product using cost-plus pricing method?	3.2.3	6.3
IQ6: How to estimate future sales volume in kilo of each critical import product?	3.3	7.4

Attachment 2. Sales data

Sales data 2009

2009			
Number	Product	Sales (VND)	Sales (%)
1	Almond Dice	28,919,000	1.28%
2	Blanched Sliced Almond	502,256,277	22.30%
3	Blanched Sliver Almonds	20,795,000	0.92%
4	Broken Cashew Kernel	283,500	0.01%
5	Brown Almond Medium Dice	1,810,000	0.08%
6	Cashew Kernel BB	3,061,114	0.14%
7	Cashew Kernel LP	1,077,300	0.05%
8	Cashew Kernel SP	19,962,900	0.89%
9	Cashew Kernel WS	9,331,000	0.41%
10	Cranberry (Soft Moist)	42,260,952	1.88%
11	Dice Cranberry	47,150,000	2.09%
12	Dice Praline Almond	22,660,000	1.01%
13	Dried Apricot	41,395,000	1.84%
14	Figs	29,735,000	1.32%
15	Golden Raisin	40,484,600	1.80%
16	Golden Raisins Jumbo	7,000,000	0.31%
17	Hazel Nuts	52,390,000	2.33%
18	Macadamia 1	98,988,095	4.39%
19	Mixed Fruits	4,935,714	0.22%
20	Natural Golden Raisin	65,573,810	2.91%
21	Natural Whole Almonds (with skin)	44,355,000	1.97%
22	Natural Whole Almonds (without skin)	36,000,000	1.60%
23	Natural Yellow Raisins	33,191,970	1.47%
24	Pecan	16,434,800	0.73%
25	Powder Almonds	355,116,414	15.76%
26	Powder Almonds (without skin)	59,440,250	2.64%
27	Prunes	97,940,514	4.35%
28	Special Cashew Kernel	222,952,653	9.90%
29	Thompson Seedless Raisins	227,421,000	10.10%
30	Walnut	119,711,000	5.31%
Total		**2,252,632,863**	**100.00%**

Sales data 2010

2010			
Number	Product	Sales (VND)	Sales (%)
1	Almond Dice	36,382,500	0.72%
2	Blanched Sliced Almond	1,186,989,351	23.57%
3	Blanched Sliver Almonds	43,856,094	0.87%
4	Cashew Kernel BB	3,126,597	0.06%
5	Cashew Kernel SP	57,672,587	1.15%
6	Cashew Kernel WS	18,881,400	0.37%
7	Cranberry (Soft Moist)	182,816,762	3.63%
8	Dice Cranberry	2,550,000	0.05%
9	Dice Praline Almond	31,420,000	0.62%
10	Dried Apricot	67,008,761	1.33%
11	Dried Cranberry (dice)	675,000	0.01%
12	Dried Red Cherry	32,551,200	0.65%
13	Figs	63,648,714	1.26%
14	Golden Raisin	2,070,710	0.04%
15	Hazel Nuts	128,221,660	2.55%
16	Macadamia 1	220,109,904	4.37%
17	Natural Whole Almonds (with skin)	72,923,413	1.45%
18	Natural Whole Almonds (without skin)	31,686,192	0.63%
19	Natural Yellow Raisins	328,311,249	6.52%
20	Pecan	68,173,259	1.35%
21	Powder Almonds	829,989,212	16.48%
22	Preserved Dried Strawberries Fine Cut	101,347,000	2.01%
23	Prunes	185,467,480	3.68%
24	Pumkin Seed GWS AA	42,710,354	0.85%
25	Special Cashew Kernel	370,602,960	7.36%
26	Sultanas Raisins	127,410,386	2.53%
27	Sunflower Seeds	17,375,836	0.35%
28	Thompson Seedless Raisins	309,542,957	6.15%
29	Walnut	471,856,260	9.37%
	Total	**5,035,377,798**	**100.00%**

Sales data 2011

2011			
Number	Product	Sales (VND)	Sales (%)
1	Almond Dice	26,760,000	0.31%
2	Black Current	800,000	0.01%
3	Blanched Sliced Almond	1,903,202,590	21.92%
4	Blanched Sliver Almonds	107,626,238	1.24%
5	Cashew Kernel SP	80,189,971	0.92%
6	Cashew Kernel WS	8,745,000	0.10%
7	Cranberry (Soft Moist)	96,089,955	1.11%
8	Dice Praline Almond	21,005,000	0.24%
9	Diced Mango	195,000	0.00%
10	Diced Papaya	150,000	0.00%
11	Diced Pineapple	160,000	0.00%
12	Dried Apricot	81,422,000	0.94%
13	Dried Cranberry (dice)	389,621,240	4.49%
14	Dried Red Cherry	55,062,200	0.63%
15	Figs	101,466,620	1.17%
16	Hazel Nuts	215,201,539	2.48%
17	Macadamia 1	430,972,383	4.96%
18	Macadamias (dice)	344,560,000	3.97%
19	Natural Whole Almonds (with skin)	142,264,592	1.64%
20	Natural Whole Almonds (without skin)	72,827,108	0.84%
21	Natural Yellow Raisins	362,728,267	4.18%
22	Pecan	259,163,003	2.98%
23	Powder Almonds	1,152,989,268	13.28%
24	Prunes	282,254,689	3.25%
25	Pumkin Seed GWS AA	124,289,773	1.43%
26	Special Cashew Kernel	399,125,800	4.60%
27	Strawberry (dice)	250,000	0.00%
28	Sultanas Raisins	513,385,148	5.91%
29	Sunflower Seeds	48,562,777	0.56%
30	Thompson Seedless Raisins	155,822,505	1.79%
31	Walnut	1,306,791,720	15.05%
32	Wild Blueberris	761,905	0.01%
	Total	**8,684,446,291**	**100.00%**

Attachment 3. Products for sale (2009–2011)

Number	Product	Year		
		2009	2010	2011
1	Almond Dice			
2	Black Current			
3	Blanched Sliced Almond			
4	Blanched Sliver Almonds			
5	Broken Kernel			
6	Brown Almond Medium Diced			
7	Cranberry (Soft Moist)			
8	Dice Cranberry			
9	Dice Mango			
10	Dice Papaya			
11	Dice Praline Almond			
12	Diced Pineapple			
13	Dried Apricot			
14	Dried Cranberry (dice)			
15	Dried Red Cherry			
16	Figs			
17	Golden Raisin			
18	Golden Raisins Jumbo			
19	Hazel Nuts			
20	Kernel BB			
21	Kernel LP			
22	Kernel SP			
23	Kernel WS			
24	Macadamia 1			
25	Macadamias (dice)			
26	Mixed fruits			
27	Natural Golden Raisin			
28	Natural Whole Almonds (with skin)			
29	Natural Whole Almonds (without skin)			
30	Natural Yellow Raisins			
31	Pecan			
32	Powder Almonds			
33	Powder Almonds (without skin)			
34	Preserved Dried Strawberry Fine Cut			
35	Prunes			
36	Pumkin Seed GWS AA			
37	Special Kernel			
38	Strawberry (dice)			
39	Sultanas Raisins			
40	Sunflower Seeds			
41	Thompson Seedless Raisins			
42	Walnut			
43	Wild Blueberries			

Note

Domestic products availability

: Products availability

Attachment 4. Sales data for study (2009–2011)

No.	Product	2009		2010		2011	
		Sales (VND)	Sales* (%)	Sales (VND)	Sales* (%)	Sales (VND)	Sales* (%)
1	Almond Dice	28,919,000	1.58%	36,382,500	0.85%	26,760,000	0.398%
2	Blanched Sliced Almond	502,256,277	27.46%	1,186,989,351	27.87%	1,903,202,590	28.327%
3	Blanched Sliver Almonds	20,795,000	1.14%	43,856,094	1.03%	107,626,238	1.602%
4	Cranberry (Soft Moist)	42,260,952	2.31%	182,816,762	4.29%	96,089,955	1.430%
5	Dice Praline Almond	22,660,000	1.24%	31,420,000	0.74%	21,005,000	0.313%
6	Dried Apricot	41,395,000	2.26%	67,008,761	1.57%	81,422,000	1.212%
7	Figs	29,735,000	1.63%	63,648,714	1.49%	101,466,620	1.510%
8	Hazel Nuts	52,390,000	2.86%	128,221,660	3.01%	215,201,539	3.203%
9	Macadamia 1	98,988,095	5.41%	220,109,904	5.17%	430,972,383	6.415%
10	Natural Whole Almonds (with skin)	44,355,000	2.43%	72,923,413	1.71%	142,264,592	2.117%
11	Natural Whole Almonds (withour skin)	36,000,000	1.97%	31,686,192	0.74%	72,827,108	1.084%
12	Natural Yellow Raisins	33,191,970	1.81%	328,311,249	7.71%	362,728,267	5.399%
13	Pecan	16,434,800	0.90%	68,173,259	1.60%	259,163,003	3.857%
14	Powder Almonds	414,556,664	22.67%	829,989,212	19.49%	1,152,989,268	17.161%
15	Prunes	97,940,514	5.35%	185,467,480	4.36%	282,254,689	4.201%
16	Thompson Seedless Raisins	227,421,000	12.43%	309,542,957	7.27%	155,822,505	2.319%
17	Walnut	119,711,000	6.55%	471,856,260	11.08%	1,306,791,720	19.450%
	Total	**1,829,010,272**	**100.00%**	**4,258,403,768**	**100.00%**	**6,718,587,477**	**100.00%**

Note

*: Adjusted Figures

Attachment 5. The 80/20 Analysis of sales data (2009–2011)

Rank	Product	2009		
		Sales (VND)	Sales* (%)	Cumulative Sales (%)
1	**Blanched Sliced Almond**	502,256,277	27.46%	27.46%
2	**Powder Almonds**	414,556,664	22.67%	50.13%
3	**Thompson Seedless Raisins**	227,421,000	12.43%	62.56%
4	**Walnut**	119,711,000	6.55%	69.11%
5	**Macadamia 1**	98,988,095	5.41%	74.52%
6	**Prunes**	97,940,514	5.35%	79.87%
7	**Hazel Nuts**	**52,390,000**	**2.86%**	**82.73%**
8	Natural Whole Almonds (with skin)	44,355,000	2.43%	85.16%
9	Cranberry (Soft Moist)	42,260,952	2.31%	87.47%
10	Dried Apricot	41,395,000	2.26%	89.73%
11	Natural Whole Almonds (withour skin)	36,000,000	1.97%	91.70%
12	Natural Yellow Raisins	33,191,970	1.81%	93.51%
13	Figs	29,735,000	1.63%	95.14%
14	Almond Dice	28,919,000	1.58%	96.72%
15	Dice Praline Almond	22,660,000	1.24%	97.96%
16	Blanched Sliver Almonds	20,795,000	1.14%	99.10%
17	Pecan	16,434,800	0.90%	100.00%
	Total	**1,829,010,272**	**42.95%**	

Rank	Product	2010		
		Sales (VND)	Sales* (%)	Cumulative Sales (%)
1	**Blanched Sliced Almond**	1,186,989,351	27.87%	27.87%
2	**Powder Almonds**	829,989,212	19.49%	47.36%
3	**Walnut**	471,856,260	11.08%	58.45%
4	**Natural Yellow Raisins**	328,311,249	7.71%	66.15%
5	**Thompson Seedless Raisins**	309,542,957	7.27%	73.42%
6	**Macadamia 1**	220,109,904	5.17%	78.59%
7	**Prunes**	**185,467,480**	**4.36%**	**82.95%**
8	Cranberry (Soft Moist)	182,816,762	4.29%	87.24%
9	Hazel Nuts	128,221,660	3.01%	90.25%
10	Natural Whole Almonds (with skin)	72,923,413	1.71%	91.96%
11	Pecan	68,173,259	1.60%	93.57%
12	Dried Apricot	67,008,761	1.57%	95.14%
13	Figs	63,648,714	1.49%	96.63%
14	Blanched Sliver Almonds	43,856,094	1.03%	97.66%
15	Almond Dice	36,382,500	0.85%	98.52%
16	Natural Whole Almonds (without skin)	31,686,192	0.74%	99.26%
17	Dice Praline Almond	31,420,000	0.74%	**100.00%**
	Total	**4,258,403,768**	**100.00%**	

Note

*: Adjusted figures

Rank	Product	2011		
		Sales (VND)	Sales* (%)	Cumulative Sales (%)
1	**Blanched Sliced Almond**	1,903,202,590	28.33%	28.33%
2	**Walnut**	1,306,791,720	19.45%	47.78%
3	**Powder Almonds**	1,152,989,268	17.16%	64.94%
4	**Macadamia 1**	430,972,383	6.41%	71.35%
5	**Natural Yellow Raisins**	362,728,267	5.40%	76.75%
6	**Prunes**	**282,254,689**	**4.20%**	**80.95%**
7	Pecan	259,163,003	3.86%	84.81%
8	Hazel Nuts	215,201,539	3.20%	88.01%
9	Thompson Seedless Raisins	155,822,505	2.32%	90.33%
10	Natural Whole Almonds (with skin)	142,264,592	2.12%	92.45%
11	Blanched Sliver Almonds	107,626,238	1.60%	94.05%
12	Figs	101,466,620	1.51%	95.56%
13	Cranberry (Soft Moist)	96,089,955	1.43%	96.99%
14	Dried Apricot	81,422,000	1.21%	98.21%
15	Natural Whole Almonds (without skin)	72,827,108	1.08%	99.29%
16	Almond Dice	26,760,000	0.40%	99.69%
17	Dice Praline Almond	21,005,000	0.31%	**100.00%**
	Total	**6,718,587,477**	**100.00%**	

Note

*: Adjusted figures

Attachment 6. Shipment information of products (2009–2011)

2009									
Shipment Information					Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
No.	Exchange Rate (USD/VND)	Total Value (USD)	Total Value* (VND)	Total Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)
776	16,973	10,260.00	174,142,980	1,544.80	454.00			100.00	
1179	16,940	6,400.50	108,424,470	1,351.60			181.60		200.00
35347	16,938	9,443.95	159,961,625	2,602.40	272.40			50.00	200.00
9285	16,956	9,600.00	162,777,600	2,000.00	1,000.00				
31269	16,966	17,549.90	297,751,603	2,389.60	908.00	500.00	181.60	100.00	200.00
74796	16,994	9,931.00	168,767,414	2,731.60		200.00	181.60		
27849	16,999	17,400.00	295,782,600	3,000.00	2,000.00	1,000.00			
103806	17,941	7,566.30	135,746,988	1,572.20			136.20	50.00	200.00
Total		88,151.65	1,503,355,280	17,192.20	4,634.40	1,700.00	681.00	300.00	800.00

2010									
Shipment Information					Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
No.	Exchange Rate (USD/VND)	Total Value (USD)	Total Value* (VND)	Total Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)
16606	18,544	7,051.50	130,763,016	736.20	136.20			200.00	100.00
1924	18,544	18,000.00	333,792,000	3,000.00	1,000.00	2,000.00			
28950	18,544	12,375.00	229,482,000	3,500.00			500.00		
56581	18,544	32,753.25	607,376,268	5,751.00	3,037.50				486.00
72096	18,544	15,175.00	281,405,200	2,900.00			1,000.00		
80440	18,932	10,150.30	192,165,480	1,457.60				100.00	
22167	18,932	30,125.00	570,326,500	5,500.00	1,500.00	3,000.00			
114972	18,932	12,625.00	239,016,500	1,880.90			90.80	200.00	600.00
Total		138,255.05	2,584,326,964	24,725.70	5,673.70	5,000.00	1,590.80	500.00	1,186.00

2011									
Shipment Information					Blanched Sliced Almond	Powder Almonds	Walnut	Macadamia 1	Prunes
No.	Exchange Rate (USD/VND)	Total Value (USD)	Total Value* (VND)	Total Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)	Quantity (kg)
1186	18,932	15,413.60	291,810,275	2,609.40	567.00				
11370	18,932	25,700.00	486,552,400	3,600.00			1,600.00		
26721	20,633	51,489.72	1,062,387,393	8,097.20	3,515.40	3,061.80		50.00	700.00
60727	20,628	13,774.00	284,130,072	972.40				300.00	200.00
82977	20,608	52,744.00	1,086,948,352	8,376.66	4,071.06	3,402.00			
84287	20,608	68,415.00	1,409,896,320	9,802.02	3,000.00	2,500.00	2,302.02		
121791	20,803	15,337.60	319,068,093	2,243.80				100.00	500.00
Total		**242,873.92**	**4,940,792,905**	**35,701.48**	**11,153.46**	**8,963.80**	**3,902.02**	**450.00**	**1,400.00**

Note

*: Round figures

Attachment 7. Weighted average purchasing price (2009–2011)

Blanched Sliced Almond

Shipment Information				Blanched Sliced Almond				
Year	No.	Ordinal No.	Exchange Rate (USD/VND)	Purchasing Price (USD/kg)	Purchasing Price* (VND/kg)	Quantity (kg)	Purchasing Value* (VND)	Weighted Average Purchasing Price* (VND/kg)
		i			p_i	q_i	$p_i \times q_i$	$\bar{p}$
2009	776	1	16,973	7.71	130,862	454.00	59,411,348	113,389
	35347	2	16,938	7.71	130,592	272.40	35,573,261	
	9285	3	16,956	7.20	122,083	1,000.00	122,083,000	
	31269	4	16,966	7.00	118,762	908.00	107,835,896	
	27849	5	16,999	5.90	100,294	2,000.00	200,588,000	
	Total					4,634.40	525,491,505	
2010	16606	1	18,544	7.16	132,775	136.20	18,083,955	117,327
	1924	2	18,544	6.20	114,973	1,000.00	114,973,000	
	56581	3	18,544	6.33	117,384	3,037.50	356,553,900	
	22167	4	18,932	6.20	117,378	1,500.00	176,067,000	
	Total					5,673.70	665,677,855	
2011	1186	1	18,932	6.35	120,218	567.00	68,163,606	133,973
	26721	2	20,633	6.35	131,020	3,515.40	460,587,708	
	82977	3	20,608	6.35	130,861	4,071.06	532,742,983	
	84287	4	20,608	7.00	144,256	3,000.00	432,768,000	
	Total					11,153.46	1,494,262,297	

Note

*: Round figures

Powder Almonds

Shipment Information				Powder Almonds				
Year	No.	Ordinal No.	Exchange Rate (USD/VND)	Purchasing Price (USD/kg)	Purchasing Price* (VND/kg)	Quantity (kg)	Purchasing Value* (VND)	Weighted Average Purchasing Price* (VND/kg)
		i			p_i	q_i	$p_i \times q_i$	$\bar{p}$
2009	31269	1	16,966	9.00	152,694	500.00	76,347,000	118,900
	74796	2	16,994	9.00	152,946	200.00	30,589,200	
	27849	3	16,999	5.60	95,194	1,000.00	95,194,000	
	Total					1,700.00	202,130,200	
2010	1924	1	18,544	5.90	109,410	2,000.00	218,820,000	110,783
	22167	2	18,932	5.90	111,699	3,000.00	335,097,000	
	Total					5,000.00	553,917,000	
2011	26721	1	20,633	6.57	135,559	3,061.80	415,054,546	136,198
	82977	2	20,608	6.57	135,395	3,402.00	460,613,790	
	84287	3	20,608	6.70	138,074	2,500.00	345,185,000	
	Total					8,963.80	1,220,853,336	

Note

*: Round figures

Walnut

Shipment Information				Walnut				
Year	No.	Ordinal No.	Exchange Rate (USD/VND)	Purchasing Price (USD/kg)	Purchasing Price* (VND/kg)	Quantity (kg)	Purchasing Price* (VND)	Weighted Average Purchasing Price* (VND/kg)
		i			p_i	q_i	$p_i \times q_i$	$\bar{p}$
2009	1179	1	16,940	6.22	105,367	181.60	19,134,647	103,911
	31269	2	16,966	6.22	105,529	181.60	19,164,066	
	74796	3	16,994	5.46	92,787	181.60	16,850,119	
	103806	4	17,941	6.39	114,643	136.20	15,614,377	
	Total					681.00	70,763,209	
2010	28950	1	18,544	9.75	180,804	500.00	90,402,000	179,801
	72096	2	18,544	9.60	178,022	1,000.00	178,022,000	
	114972	3	18,932	10.24	193,864	90.80	17,602,851	
	Total					1,590.80	286,026,851	
2011	11370	1	18,932	12.50	236,650	1,600.00	378,640,000	228,828
	84287	2	20,608	10.84	223,391	2,302.02	514,250,550	
	Total					3,902.02	892,890,550	

Note

*: Round figures

Macadamia 1

Shipment Information				Macadamia 1				
Year	No.	Ordinal No.	Exchange Rate (USD/VND)	Purchasing Price (USD/kg)	Purchasing Price* (VND/kg)	Quantity (kg)	Purchasing Price* (VND)	Weighted Average Purchasing Price* (VND/kg)
		i			p_i	q_i	$p_i \times q_i$	$\bar{p}$
2009	776	1	16,973	13.50	229,136	100.00	22,913,600	240,605
	35347	2	16,938	14.50	245,601	50.00	12,280,050	
	31269	3	16,966	13.50	229,041	100.00	22,904,100	
	103806	4	17,941	15.70	281,674	50.00	14,083,700	
	Total					300.00	72,181,450	
2010	16606	1	18,544	15.70	291,141	200.00	58,228,200	337,961
	80440	2	18,932	19.50	369,174	100.00	36,917,400	
	114972	3	18,932	19.50	369,174	200.00	73,834,800	
	Total					500.00	168,980,400	
2011	26721	1	20,633	19.50	402,344	50.00	20,117,200	437,927
	60727	2	20,628	21.40	441,439	300.00	132,431,700	
	121791	3	20,803	21.40	445,184	100.00	44,518,400	
	Total					450.00	197,067,300	

Note

*: Round figures

Prunes

Shipment Information				Prunes				
Year	No.	Ordinal No.	Exchange Rate (USD/VND)	Purchasing Price (USD/kg)	Purchasing Price* (VND/kg)	Quantity (kg)	Purchasing Price* (VND)	Weighted Average Purchasing Price* (VND/kg)
		i			p_i	q_i	$p_i \times q_i$	$\bar{p}$
2009	1179	1	16,940	4.28	72,503	200.00	14,500,600	74,138
	35347	2	16,938	4.28	72,495	200.00	14,499,000	
	31269	3	16,966	4.28	72,614	200.00	14,522,800	
	103806	4	17,941	4.40	78,940	200.00	15,788,000	
	Total					800.00	59,310,400	
2010	16606	1	18,544	4.40	81,594	100.00	8,159,400	69,311
	56581	2	18,544	2.67	49,512	486.00	24,062,832	
	114972	3	18,932	4.40	83,301	600.00	49,980,600	
	Total					1,186.00	82,202,832	
2011	26721	1	20,633	4.40	90,785	700.00	63,549,500	93,649
	60727	2	20,628	4.40	90,763	200.00	18,152,600	
	121791	3	20,803	4.75	98,814	500.00	49,407,000	
	Total					1,400.00	131,109,100	

Note

*: Round figures

Attachment 8. Weighted average freight cost (2009–2011)

Blanched Sliced Almond

Shipment Information					Blanched Sliced Almond		
Year	No.	Ordinal No.	Total Freight Cost (VND)	Total Quantity (kg)	Freight Cost* (VND)	Quantity (kg)	Weighted Average Freight Cost* (VND)
		i	F_{ti}	Q_i	F_i	q_i	$\bar{f}$
2009	776	1	2,833,056	1,544.80	832,604	454.00	1,633
	35347	2	3,752,635	2,602.40	392,798	272.40	
	9285	3	3,221,981	2,000.00	1,610,991	1,000.00	
	31269	4	3,652,280	2,389.60	1,387,793	908.00	
	27849	5	5,016,131	3,000.00	3,344,087	2,000.00	
			Total		7,568,273	4,634.40	
2010	16606	1	2,337,110	736.20	432,375	136.20	1,305
	1924	2	8,518,600	3,000.00	2,839,533	1,000.00	
	56581	3	3,319,478	5,751.00	1,753,245	3,037.50	
	22167	4	8,716,500	5,500.00	2,377,227	1,500.00	
			Total		7,402,380	5,673.70	
2011	1186	1	4,582,500	2,609.40	995,738	567.00	923
	26721	2	10,393,260	8,097.20	4,512,235	3,515.40	
	82977	3	6,195,000	8,376.66	3,010,772	4,071.06	
	84287	4	5,802,650	9,802.02	1,775,955	3,000.00	
			Total		10,294,700	11,153.46	

Note

*: Round figures

Powder Almonds

Shipment Information					Powder Almonds		
Year	No.	Ordinal No.	Total Freight Cost (VND)	Total Quantity (kg)	Freight Cost* (VND)	Quantity (kg)	Weighted Average Freight Cost* (VND)
		i	F_{ti}	Q_i	F_i	q_i	$\bar{f}$
2009	31269	1	3,652,280	2,389.60	764,203	500.00	1,618
	74796	2	4,300,404	2,731.60	314,863	200.00	
	27849	3	5,016,131	3,000.00	1,672,044	1,000.00	
			Total		2,751,110	1,700.00	
2010	1924	1	8,518,600	3,000.00	5,679,067	2,000.00	2,087
	22167	2	8,716,500	5,500.00	4,754,455	3,000.00	
			Total		10,433,522	5,000.00	
2011	26721	1	10,393,260	8,097.20	3,930,011	3,061.80	884
	82977	2	6,195,000	8,376.66	2,515,966	3,402.00	
	84287	3	5,802,650	9,802.02	1,479,963	2,500.00	
			Total		7,925,940	8,963.80	

Note

*: Round figures

Walnut

Shipment Information					Walnut		
Year	No.	Ordinal No.	Total Freight Cost (VND)	Total Quantity (kg)	Freight Cost* (VND)	Quantity (kg)	Weighted Average Freight Cost* (VND)
		i	F_{ti}	Q_i	F_i	q_i	$\bar{f}$
2009	1179	1	2,312,310	1,351.60	310,680	181.60	1,662
	31269	2	3,652,280	2,389.60	277,559	181.60	
	74796	3	4,300,404	2,731.60	285,896	181.60	
	103806	4	2,976,271	1,572.20	257,835	136.20	
			Total		1,131,970	681.00	
2010	28950	1	2,706,750	3,500.00	386,679	500.00	1,311
	72096	2	4,354,800	2,900.00	1,501,655	1,000.00	
	114972	3	4,075,500	1,880.90	196,744	90.80	
			Total		2,085,078	1,590.80	
2011	11370	1	6,142,500	3,600.00	2,730,000	1,600.00	1,049
	84287	2	5,802,650	9,802.02	1,362,762	2,302.02	
			Total		4,092,762	3,902.02	

Note

*: Round figures

Macadamia 1

Shipment Information					Macadamia 1		
Year	No.	Ordinal No.	Total Freight Cost (VND)	Total Quantity (kg)	Freight Cost* (VND)	Quantity (kg)	Weighted Average Freight Cost* (VND)
		i	F_{ti}	Q_i	F_i	q_i	$\bar{f}$
2009	776	1	2,833,056	1,544.80	183,393	100.00	1,677
	35347	2	3,752,635	2,602.40	72,100	50.00	
	31269	3	3,652,280	2,389.60	152,841	100.00	
	103806	4	2,976,271	1,572.20	94,653	50.00	
			Total		502,987	300.00	
2010	16606	1	2,337,110	736.20	634,912	200.00	2,601
	80440	2	3,385,414	1,457.60	232,259	100.00	
	114972	3	4,075,500	1,880.90	433,356	200.00	
			Total		1,300,527	500.00	
2011	26721	1	10,393,260	8,097.20	64,178	50.00	2,678
	60727	2	3,084,300	972.40	951,553	300.00	
	121791	3	4,244,222	2,243.80	189,153	100.00	
			Total		1,204,884	450.00	

Note

*: Round figures

Prunes

Shipment Information					Prunes		
Year	No.	Ordinal No.	Total Freight Cost (VND)	Total Quantity (kg)	Freight Cost* (VND)	Quantity (kg)	Weighted Average Freight Cost* (VND)
		i	F_{ti}	Q_i	F_i	q_i	$\bar{f}$
2009	1179	1	2,312,310	1,351.60	342,159	200.00	1,644
	35347	2	3,752,635	2,602.40	288,398	200.00	
	31269	3	3,652,280	2,389.60	305,681	200.00	
	103806	4	2,976,271	1,572.20	378,612	200.00	
			Total		1,314,850	800.00	
2010	16606	1	2,337,110	736.20	317,456	100.00	1,600
	56581	2	3,319,478	5,751.00	280,519	486.00	
	114972	3	4,075,500	1,880.90	1,300,069	600.00	
			Total		1,898,044	1,186.00	
2011	26721	1	10,393,260	8,097.20	898,494	700.00	1,770
	60727	2	3,084,300	972.40	634,369	200.00	
	121791	3	4,244,222	2,243.80	945,767	500.00	
			Total		2,478,630	1,400.00	

Note

*: Round figures

Attachment 9. Weighted average service cost (2009–2011)

Blanched Sliced Almond

Shipment Information									Blanched Sliced Almond		
Year	No.	Ordinal No.	Total Quantity (kg)	Service Fee (VND)	Documents Submission Fee (VND)	Plant Inspection Fee (VND)	QUATEST 3 Fee (VND)	Total Service Cost (VND)	Product Service Cost* (VND)	Quantity (kg)	Weighted Average Service Cost* (VND/kg)
		i	Q_i					S_{ti}	S_i	q_i	$\bar{s}$
2009	776	1	1544.80	2,750,000	30,000	285,000	500,000	3,565,000	1,047,715	454.00	1,562
	35347	2	2602.40	2,860,000	20,000	215,000	500,000	3,595,000	376,298	272.40	
	9285	3	2000.00	2,860,000	20,000	285,000	500,000	3,665,000	1,832,500	1,000.00	
	31269	4	2389.60	2,860,000	20,000	285,000	500,000	3,665,000	1,392,626	908.00	
	27849	5	3000.00	3,080,000	20,000	285,000	500,000	3,885,000	2,590,000	2,000.00	
					Total				7,239,139	4,634.40	
2010	16606	1	736.20	2,750,000	20,000	278,000	500,000	3,548,000	656,394	136.20	981
	1924	2	3000.00	3,080,000	20,000	285,000	500,000	3,885,000	1,295,000	1,000.00	
	56581	3	5751.00	3,850,000	20,000	229,000	500,000	4,599,000	2,429,049	3,037.50	
	22167	4	5500.00	3,520,000	20,000	215,000	587,000	4,342,000	1,184,182	1,500.00	
					Total				5,564,625	5,673.70	
2011	1186	1	2609.40	2,970,000	-	285,000	500,000	3,755,000	815,929	567.00	707
	26721	2	8097.20	3,850,000	-	292,000	1,075,000	5,217,000	2,264,961	3,515.40	
	82977	3	8376.66	4,400,000	-	292,000	1,087,000	5,779,000	2,808,596	4,071.06	
	84287	4	9802.02	4,812,500	-	292,000	1,413,000	6,517,500	1,994,742	3,000.00	
					Total				7,884,228	11,153.46	

Note

*: Round figures

Powder Almonds

Shipment Information									Powder Almonds		
Year	No.	Ordinal No.	Total Quantity (kg)	Service Fee (VND)	Documents Submission Fee (VND)	Plant Inspection Fee (VND)	QUATEST 3 Fee (VND)	Total Service Cost (VND)	Product Service Cost* (VND)	Quantity (kg)	Weighted Average Service Cost* (VND/kg)
		i	Q_i					S_{ti}	S_i	q_i	$\bar{s}$
2009	31269	1	2,389.60	2,860,000	20,000	285,000	500,000	3,665,000	766,865	500.00	1,380
	74796	2	2,731.60	3,080,000	20,000	285,000	500,000	3,885,000	284,449	200.00	
	27849	3	3,000.00	3,080,000	20,000	285,000	500,000	3,885,000	1,295,000	1,000.00	
					Total				2,346,314	1,700.00	
2010	1924	1	3,000.00	3,080,000	20,000	285,000	500,000	3,885,000	2,590,000	2,000.00	992
	22167	2	5,500.00	3,520,000	20,000	215,000	587,000	4,342,000	2,368,364	3,000.00	
					Total				4,958,364	5,000.00	
2011	26721	1	8,097.20	3,850,000	-	292,000	1,075,000	5,217,000	1,972,708	3,061.80	667
	82977	2	8,376.66	4,400,000	-	292,000	1,087,000	5,779,000	2,347,016	3,402.00	
	84287	3	9,802.02	4,812,500	-	292,000	1,413,000	6,517,500	1,662,285	2,500.00	
					Total				5,982,009	8,963.80	

Note

*: Round figures

Walnut

Shipment Information									Walnut		
Year	No.	Ordinal No.	Total Quantity (kg)	Service Fee (VND)	Documents Submission Fee (VND)	Plant Inspection Fee (VND)	QUATEST 3 Fee (VND)	Total Service Cost (VND)	Product Service Cost* (VND)	Quantity (kg)	Weighted Average Service Cost* (VND/kg)
		i	Q_i					S_{ti}	S_i	q_i	$\bar{s}$
2009	1179	1	1,351.60	2,750,000	30,000	285,000	500,000	3,565,000	478,991	181.60	1,958
	31269	2	2,389.60	2,860,000	20,000	285,000	500,000	3,665,000	278,525	181.60	
	74796	3	2,731.60	3,080,000	20,000	285,000	500,000	3,885,000	258,279	181.60	
	103806	4	1,572.20	2,860,000	20,000	285,000	500,000	3,665,000	317,500	136.20	
					Total				1,333,295	681.00	
2010	28950	1	3,500.00	3,850,000	20,000	215,000	500,000	4,585,000	655,000	500.00	1,321
	72096	2	2,900.00	2,860,000	20,000	285,000	500,000	3,665,000	1,263,793	1,000.00	
	114972	3	1,880.90	2,970,000	20,000	285,000	500,000	3,775,000	182,237	90.80	
					Total				2,101,030	1,590.80	
2011	11370	1	3,600.00	3,080,000	-	215,000	500,000	3,795,000	1,686,667	1,600.00	825
	84287	2	9,802.02	4,812,500	-	292,000	1,413,000	6,517,500	1,530,645	2,302.02	
					Total				3,217,312	3,902.02	

Note

*: Round figures

Macadamia 1

Shipment Information									Macadamia 1		
Year	No.	Ordinal No.	Total Quantity (kg)	Service Fee (VND)	Documents Submission Fee (VND)	Plant Inspection Fee (VND)	QUATEST 3 Fee (VND)	Total Service Cost (VND)	Product Service Cost* (VND)	Quantity (kg)	Weighted Average Service Cost* (VND/kg)
		i	Q_i					S_{ti}	S_i	q_i	$\bar{s}$
2009	776	1	1,544.80	2,750,000	30,000	285,000	500,000	3,565,000	230,774	100.00	1,899
	35347	2	2,602.40	2,860,000	20,000	215,000	500,000	3,595,000	69,071	50.00	
	31269	3	2,389.60	2,860,000	20,000	285,000	500,000	3,665,000	153,373	100.00	
	103806	4	1,572.20	2,860,000	20,000	285,000	500,000	3,665,000	116,556	50.00	
					Total				569,774	300.00	
2010	16606	1	736.20	2,750,000	20,000	278,000	500,000	3,548,000	963,869	200.00	3,249
	80440	2	1,457.60	2,970,000	20,000	285,000	500,000	3,775,000	258,987	100.00	
	114972	3	1,880.90	2,970,000	20,000	285,000	500,000	3,775,000	401,404	200.00	
					Total				1,624,260	500.00	
2011	26721	1	8,097.20	3,850,000	-	292,000	1,075,000	5,217,000	32,215	50.00	3,412
	60727	2	972.40	3,465,000	-	278,000	500,000	4,243,000	1,309,029	300.00	
	121791	3	2,243.80	3,575,000	-	285,000	500,000	4,360,000	194,313	100.00	
					Total				1,535,557	450.00	

Note

*: Round figures

Prunes

Shipment Information									Prunes		
Year	No.	Ordinal No.	Total Quantity (kg)	Service Fee (VND)	Documents Submission Fee (VND)	Plant Inspection Fee (VND)	QUATEST 3 Fee (VND)	Total Service Cost (VND)	Product Service Cost* (VND)	Quantity (kg)	Weighted Average Service Cost* (VND/kg)
		i	Q_i					S_{ti}	S_i	q_i	$\bar{s}$
2009	1179	1	1,351.60	2,750,000	30,000	285,000	500,000	3,565,000	527,523	200.00	1,971
	35347	2	2,602.40	2,860,000	20,000	215,000	500,000	3,595,000	276,283	200.00	
	31269	3	2,389.60	2,860,000	20,000	285,000	500,000	3,665,000	306,746	200.00	
	103806	4	1,572.20	2,860,000	20,000	285,000	500,000	3,665,000	466,226	200.00	
					Total				1,576,778	800.00	
2010	16606	1	736.20	2,750,000	20,000	278,000	500,000	3,548,000	481,934	100.00	1,749
	56581	2	5,751.00	3,850,000	20,000	229,000	500,000	4,599,000	388,648	486.00	
	114972	3	1,880.90	2,970,000	20,000	285,000	500,000	3,775,000	1,204,211	600.00	
					Total				2,074,793	1,186.00	
2011	26721	1	8,097.20	3,850,000	-	292,000	1,075,000	5,217,000	451,008	700.00	1,639
	60727	2	972.40	3,465,000	-	278,000	500,000	4,243,000	872,686	200.00	
	121791	3	2,243.80	3,575,000	-	285,000	500,000	4,360,000	971,566	500.00	
					Total				2,295,260	1,400.00	

Note

*: Round figures

Attachment 10. Weighted average import tax (2009–2011)

Blanched Sliced Almond

Shipment Information					Blanched Sliced Almond					
Year	No.	Ordinal No.	Total Value* (VND)	Total Freight Cost (VND)	Purchasing Value* (VND)	Import Tax Base* (VND)	Tax Rate (%)	Import Tax* (VND)	Quantity (kg)	Weighted Average Import Tax* (VND)
		i	V_{ti}	F_{ti}	P_i	ITB_i		IT_i	q_i	$\overline{it}$
2009	776	1	174,142,980	2,833,056	59,411,348	60,377,885	28%	16,905,808	454.00	12,443
	35347	2	159,961,625	3,752,635	35,573,261	36,407,795	28%	10,194,183	272.40	
	9285	3	162,777,600	3,221,981	122,083,000	124,499,482	0%	-	1,000.00	
	31269	4	297,751,603	3,652,280	107,835,896	109,158,632	28%	30,564,417	908.00	
	27849	5	295,782,600	5,016,131	200,588,000	203,989,741	0%	-	2,000.00	
			Total					57,664,408	4,634.40	
2010	16606	1	130,763,016	2,337,110	18,083,955	18,407,167	20%	3,681,433	136.20	13,286
	1924	2	333,792,000	8,518,600	114,973,000	117,907,190	0%	-	1,000.00	
	56581	3	607,376,268	3,319,478	356,553,900	358,502,565	20%	71,700,513	3,037.50	
	22167	4	570,326,500	8,716,500	176,067,000	178,757,894	0%	-	1,500.00	
			Total					75,381,946	5,673.70	
2011	1186	1	291,810,275	4,582,500	68,163,606	69,234,027	15%	10,385,104	567.00	14,392
	26721	2	1,062,387,393	10,393,260	460,587,708	465,093,605	15%	69,764,041	3,515.40	
	82977	3	1,086,948,352	6,195,000	532,742,983	535,779,321	15%	80,366,898	4,071.06	
	84287	4	1,409,896,320	5,802,650	432,768,000	434,549,125	0%	-	3,000.00	
			Total					160,516,043	11,153.46	

Note

*: Round figures

Powder Almonds

Shipment Information					Powder Almonds					
Year	No.	Ordinal No.	Total Value* (VND)	Total Freight Cost (VND)	Purchasing Value* (VND)	Import Tax Base* (VND)	Tax Rate (%)	Import Tax* (VND)	Quantity (kg)	Weighted Average Import Tax* (VND)
		i	V_{ti}	F_{ti}	P_i	ITB_i		IT_i	q_i	$\overline{it}$
2009	31269	1	297,751,603	3,652,280	76,347,000	77,283,487	5%	3,864,174	500.00	3,196
	74796	2	168,767,414	4,300,404	30,589,200	31,368,651	5%	1,568,433	200.00	
	27849	3	295,782,600	5,016,131	95,194,000	96,808,380	0%	-	1,000.00	
			Total					5,432,607	1,700.00	
2010	1924	1	333,792,000	8,518,600	218,820,000	224,404,436	0%	-	2,000.00	-
	22167	2	570,326,500	8,716,500	335,097,000	340,218,405	0%	-	3,000.00	
			Total					-	5,000.00	
2011	26721	1	1,062,387,393	10,393,260	415,054,546	419,114,995	15%	62,867,249	3,061.80	14,765
	82977	2	1,086,948,352	6,195,000	460,613,790	463,239,032	15%	69,485,855	3,402.00	
	84287	3	1,409,896,320	5,802,650	345,185,000	346,605,663	0%	-	2,500.00	
			Total					132,353,104	8,963.80	

Note

*: Round figures

Walnut

Shipment Information					Walnut					
Year	No.	Ordinal No.	Total Value* (VND)	Total Freight Cost (VND)	Purchasing Value* (VND)	Import Tax Base* (VND)	Tax Rate (%)	Import Tax* (VND)	Quantity (kg)	Weighted Average Import Tax* (VND)
		i	V_{ti}	F_{ti}	P_i	ITB_i		IT_i	q_i	$\bar{it}$
2009	1179	1	108,424,470	2,312,310	19,134,647	19,542,721	5%	977,136	181.60	5,299
	31269	2	297,751,603	3,652,280	19,164,066	19,399,136	5%	969,957	181.60	
	74796	3	168,767,414	4,300,404	16,850,119	17,279,481	5%	863,974	181.60	
	103806	4	135,746,988	2,976,271	15,614,377	15,956,724	5%	797,836	136.20	
			Total					3,608,903	681.00	
2010	28950	1	229,482,000	2,706,750	90,402,000	91,468,295	0%	-	500.00	563
	72096	2	281,405,200	4,354,800	178,022,000	180,776,925	0%	-	1,000.00	
	114972	3	239,016,500	4,075,500	17,602,851	17,902,999	5%	895,150	90.80	
			Total					895,150	1,590.80	
2011	11370	1	486,552,400	6,142,500	378,640,000	383,420,156	0%	-	1,600.00	0
	84287	2	1,409,896,320	5,802,650	514,250,550	516,367,029	0%	-	2,302.02	
			Total					-	3,902.02	

Note

*: Round figures

Macadamia 1

Shipment Information					Macadamia 1					
Year	No.	Ordinal No.	Total Value* (VND)	Total Freight Cost (VND)	Purchasing Value* (VND)	Import Tax Base* (VND)	Tax Rate (%)	Import Tax* (VND)	Quantity (kg)	Weighted Average Import Tax* (VND)
		i	V_{ti}	F_{ti}	P_i	ITB_i		IT_i	q_i	$\overline{it}$
2009	776	1	174,142,980	2,833,056	22,913,600	23,286,371	33%	7,684,502	100.00	80,775
	35347	2	159,961,625	3,752,635	12,280,050	12,568,135	33%	4,147,485	50.00	
	31269	3	297,751,603	3,652,280	22,904,100	23,185,046	33%	7,651,065	100.00	
	103806	4	135,746,988	2,976,271	14,083,700	14,392,487	33%	4,749,521	50.00	
			Total					**24,232,573**	**300.00**	
2010	16606	1	130,763,016	2,337,110	58,228,200	59,268,905	30%	17,780,672	200.00	103,158
	80440	2	192,165,480	3,385,414	36,917,400	37,567,781	30%	11,270,334	100.00	
	114972	3	239,016,500	4,075,500	73,834,800	75,093,766	30%	22,528,130	200.00	
			Total					**51,579,136**	**500.00**	
2011	26721	1	1,062,387,393	10,393,260	20,117,200	20,314,005	30%	6,094,202	50.00	132,863
	60727	2	284,130,072	3,084,300	132,431,700	133,869,278	30%	40,160,783	300.00	
	121791	3	319,068,093	4,244,222	44,518,400	45,110,581	30%	13,533,174	100.00	
			Total					**59,788,159**	**450.00**	

Note

*: Round figures

Prunes

Shipment Information					Prunes					
Year	No.	Ordinal No.	Total Value* (VND)	Total Freight Cost (VND)	Purchasing Value* (VND)	Import Tax Base* (VND)	Tax Rate (%)	Import Tax* (VND)	Quantity (kg)	Weighted Average Import Tax* (VND)
		i	V_{ti}	F_{ti}	P_i	ITB_i		IT_i	q_i	$\overline{it}$
2009	1179	1	108,424,470	2,312,310	14,500,600	14,809,846	33%	4,887,249	200.00	24,950
	35347	2	159,961,625	3,752,635	14,499,000	14,839,141	33%	4,896,917	200.00	
	31269	3	297,751,603	3,652,280	14,522,800	14,700,940	33%	4,851,310	200.00	
	103806	4	135,746,988	2,976,271	15,788,000	16,134,154	33%	5,324,271	200.00	
			Total					19,959,747	800.00	
2010	16606	1	130,763,016	2,337,110	8,159,400	8,305,232	30%	2,491,570	100.00	21,079
	56581	2	607,376,268	3,319,478	24,062,832	24,194,342	30%	7,258,303	486.00	
	114972	3	239,016,500	4,075,500	49,980,600	50,832,825	30%	15,249,848	600.00	
			Total					24,999,721	1,186.00	
2011	26721	1	1,062,387,393	10,393,260	63,549,500	64,171,200	30%	19,251,360	700.00	28,411
	60727	2	284,130,072	3,084,300	18,152,600	18,349,651	30%	5,504,895	200.00	
	121791	3	319,068,093	4,244,222	49,407,000	50,064,209	30%	15,019,263	500.00	
			Total					39,775,518	1,400.00	

Note

*: Round figures

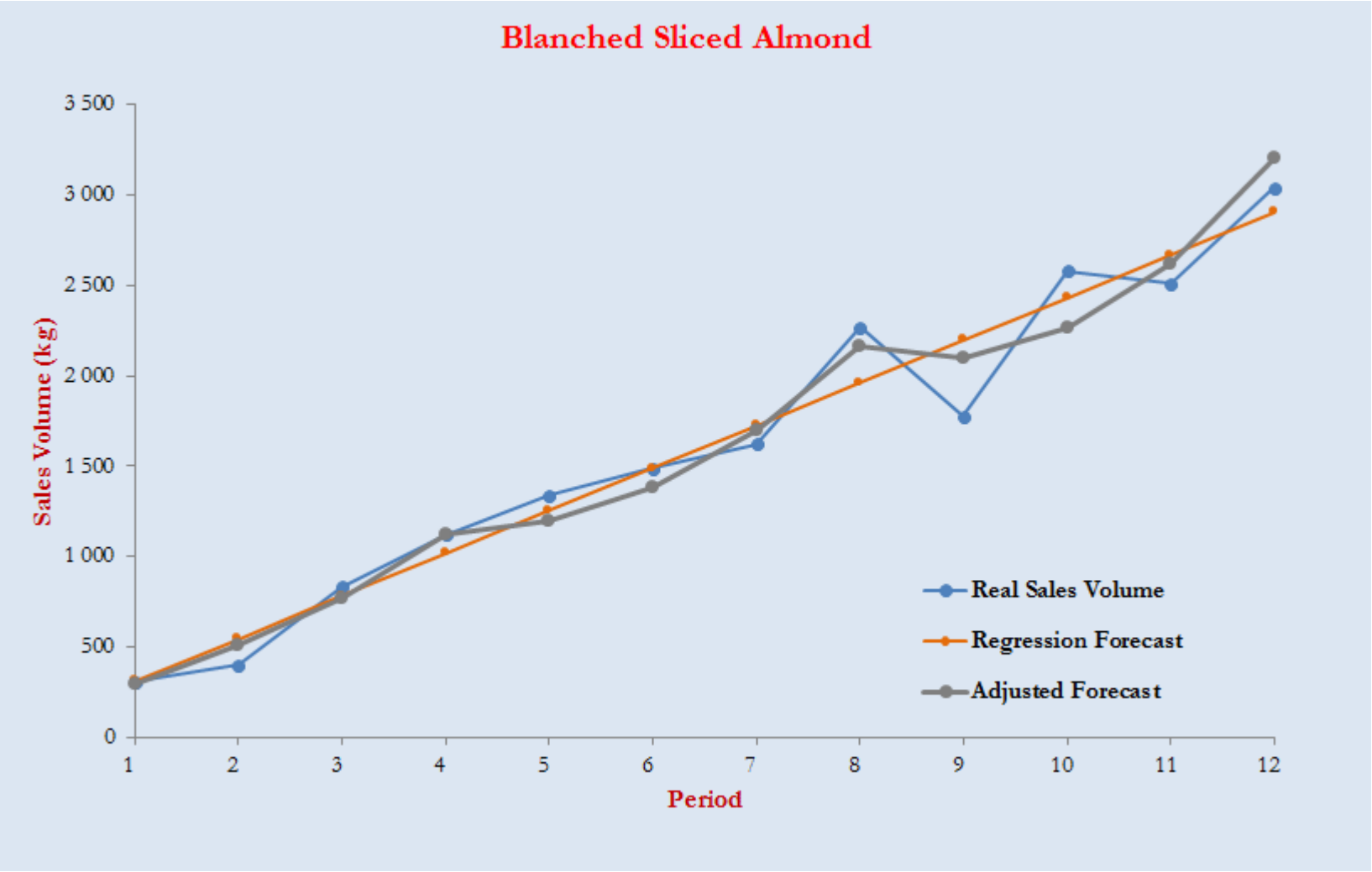
Attachment 11. Linear regression forecast of products (2009–2011)

Blanched Sliced Almond

Time Series				Blanched Sliced Almond							
Year	Quarter	Period	x^2	Sales Volume* (kg)	xy	Regression Forecast (kg)	Ratio*	Sesonal Index	Adjusted Regression Forecast* (kg)	Forecast Error	Absolute Deviation
		x, i		y		$\hat{y}$	$(y/\hat{y})$			FE_i	$\lvert FE_i \rvert$
2009	1	1	1	309	309	311.03	0.993	0.957	298	11	11
	2	2	4	400	800	546.57	0.732	0.930	508	-108	108
	3	3	9	834	2,502	782.11	1.066	0.983	769	65	65
	4	4	16	1,120	4,480	1,017.65	1.101	1.102	1,121	-1	1
2010	1	5	25	1,341	6,705	1,253.19	1.070	0.957	1,199	142	142
	2	6	36	1,485	8,910	1,488.73	0.997	0.930	1,385	100	100
	3	7	49	1,624	11,368	1,724.27	0.942	0.983	1,695	-71	71
	4	8	64	2,269	18,152	1,959.81	1.158	1.102	2,160	109	109
2011	1	9	81	1,776	15,984	2,195.35	0.809	0.957	2,101	-325	325
	2	10	100	2,576	25,760	2,430.89	1.060	0.930	2,261	315	315
	3	11	121	2,509	27,599	2,666.43	0.941	0.983	2,621	-112	112
	4	12	144	3,035	36,420	2,901.97	1.046	1.102	3,198	-163	163
Total		78	650	19,278	158,989					-38	1,522
Average		6.50		1,606.50							
The estimated slope coefficient*				235.54		Linear regression formula			$\hat{y} = \hat{a}x + \hat{b} = 235.54 \times x + 75.49$		
The estimated intercept term*				75.49							
Mean forecast error (MFE)*				-3.17							
Mean absolute deviation (MAD)*				126.83							

Note

*: Round figures

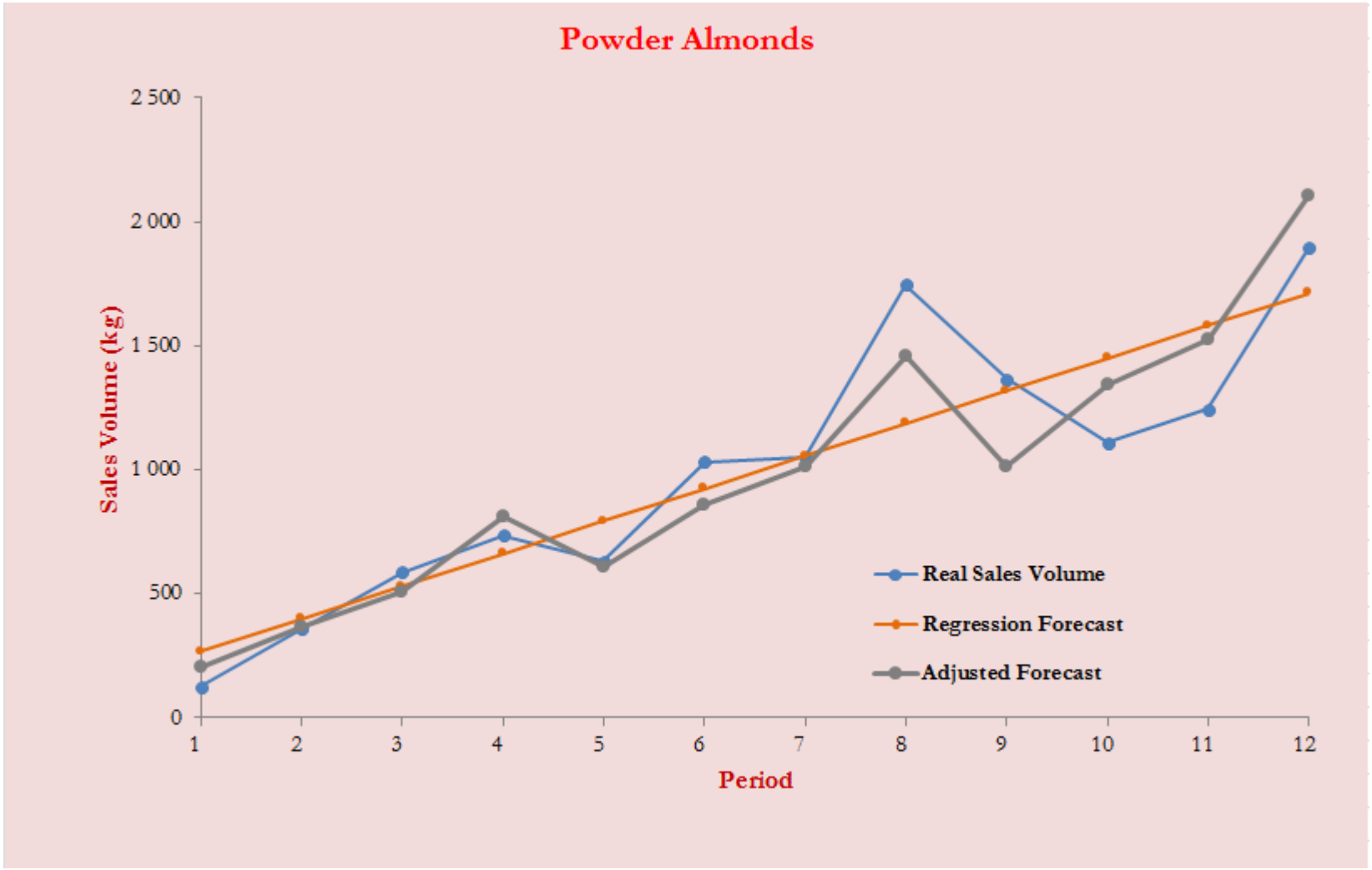

Blanched Sliced Almond
Sales Volume (kg)
3 500
3 000
2 500
2 000
1 500
1 000
500
0
1
2
3
4
5
6
7
8
9
10
11
12
Period
Real Sales Volume
Regression Forecast
Adjusted Forecast

Powder Almonds

Time Series				Powder Almonds							
Year	Quarter	Period	x^2	Sales Volume* (kg)	xy	Regression Forecast (kg)	Ratio	Sesonal Index	Adjusted Regression Forecast* (kg)	Forecast Error	Absolute Deviation
		x, i		y		$\hat{y}$	$(y/\hat{y})$			FE_i	$\lvert FE_i \rvert$
2009	1	1	1	127	127	266.75	0.476	0.769	205	-78	78
	2	2	4	357	714	398.25	0.896	0.926	369	-12	12
	3	3	9	588	1,764	529.75	1.110	0.963	510	78	78
	4	4	16	736	2,944	661.25	1.113	1.230	813	-77	77
2010	1	5	25	630	3,150	792.75	0.795	0.769	610	20	20
	2	6	36	1,032	6,192	924.25	1.117	0.926	856	176	176
	3	7	49	1,048	7,336	1,055.75	0.993	0.963	1,017	31	31
	4	8	64	1,745	13,960	1,187.25	1.470	1.230	1,460	285	285
2011	1	9	81	1,367	12,303	1,318.75	1.037	0.769	1,014	353	353
	2	10	100	1,111	11,110	1,450.25	0.766	0.926	1,343	-232	232
	3	11	121	1,243	13,673	1,581.75	0.786	0.963	1,523	-280	280
	4	12	144	1,896	22,752	1,713.25	1.107	1.230	2,107	-211	211
Total		78	650	11,880	96,025					53	1,833
Average		6.50		990.00							
The estimated slope coefficient*				131.50		Linear regression formula $\hat{y} = \hat{a}x + \hat{b} = 131.50 \times x + 135.25$					
The estimated intercept term*				135.25							
Mean forecast error (MFE)*				4.42							
Mean absolute deviation (MAD)*				152.75							

Note

*: Round figures


Powder Almonds
Sales Volume (kg)
2 500
2 000
1 500
1 000
500
0
1
2
3
4
5
6
7
8
9
10
11
12
Period
Real Sales Volume
Regression Forecast
Adjusted Forecast

Walnut

Time Series				Walnut								
Year	Quarter	Period	x^2	Sales Volume* (kg)	xy	Regression Forecast (kg)	Ratio	Sesonal Index	Adjusted Regression Forecast* (kg)	Forecast Error	Absolute Deviation
		x, i		y		$\hat{y}$	$(y/\hat{y})$			FE_i	$\lvert FE_i \rvert$
2009	1	1	1	-	-	-	-	0.260	-	-	-
	2	2	4	42	84	11.60	3.622	1.773	21	21	21
	3	3	9	322	966	126.19	2.552	1.674	211	111	111
	4	4	16	247	988	240.78	1.026	0.999	241	6	6
2010	1	5	25	69	345	355.37	0.194	0.260	92	-23	23
	2	6	36	327	1,962	469.96	0.696	1.773	833	-506	506
	3	7	49	599	4,193	584.55	1.025	1.674	979	-380	380
	4	8	64	721	5,768	699.14	1.031	0.999	698	23	23
2011	1	9	81	476	4,284	813.73	0.585	0.260	212	264	264
	2	10	100	929	9,290	928.32	1.001	1.773	1,646	-717	717
	3	11	121	1,508	16,588	1,042.91	1.446	1.674	1,746	-238	238
	4	12	144	1,087	13,044	1,157.50	0.939	0.999	1,156	-69	69
Total		78	650	6,327	57,512					-1,508	2,358
Average		6.50		527.25							
The estimated slope coefficient*				114.59		Linear regression formula $\hat{y} = \hat{a}x + \hat{b} = 114.59 \times x - 217.59$					
The estimated intercept term*				-217.59							
Mean forecast error (MFE)*				-125.67							
Mean absolute deviation (MAD)*				196.50							

Note

*: Round figures

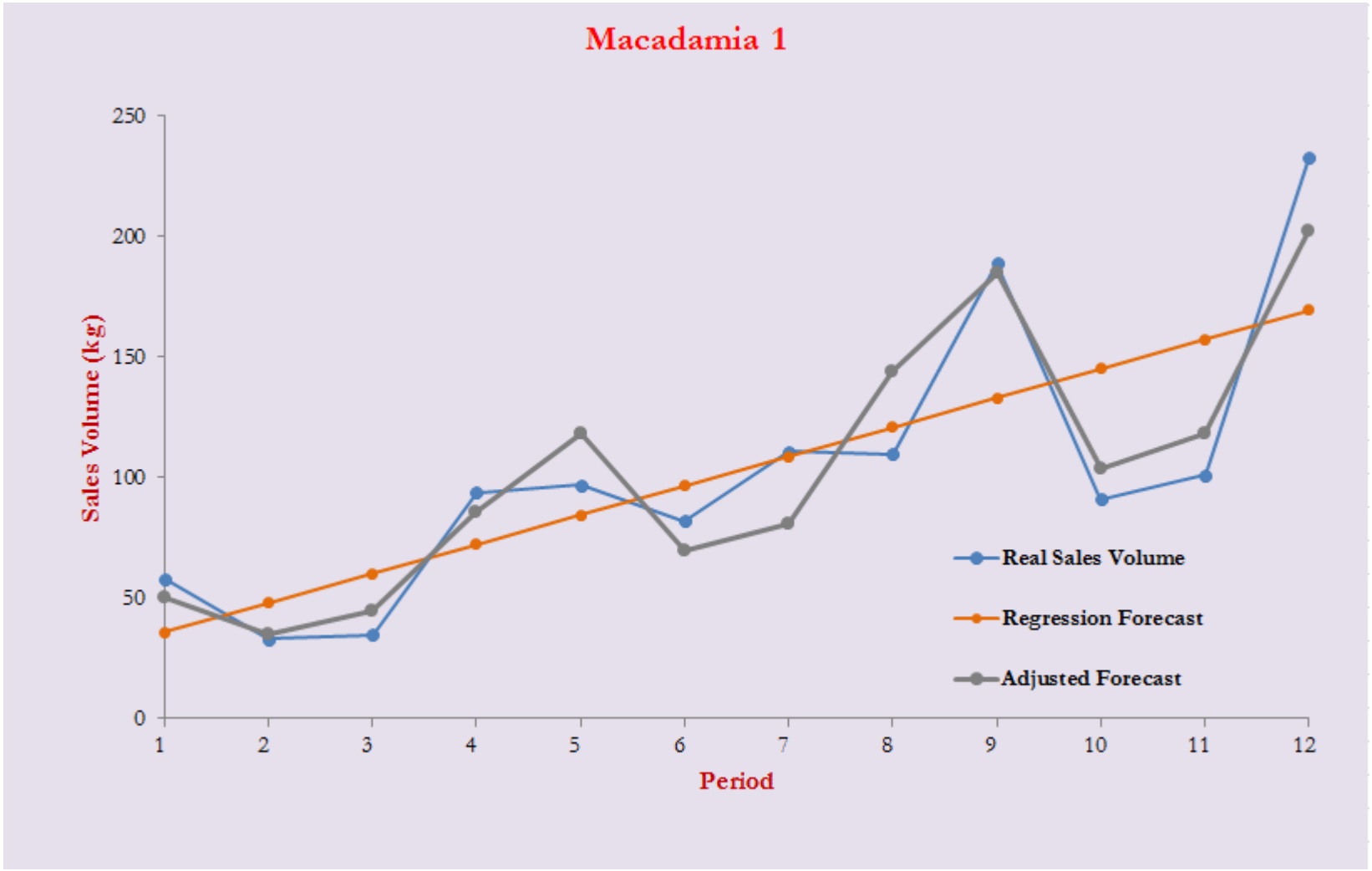

Walnut
Real Sales Volume
Regression Forecast
Adjusted Forecast
Sales Volume (kg)
1 750
1 500
1 250
1 000
750
500
250
0
1
2
3
4
5
6
7
8
9
10
11
12
Period

Macadamia 1

Time Series				Macadamia 1							
Year	Quarter	Period	x^2	Sales Volume* (kg)	xy	Regression Forecast (kg)	Ratio	Sesonal Index	Adjusted Regression Forecast* (kg)	Forecast Error	Absolute Deviation
		x, i		y		$\hat{y}$	$(y/\hat{y})$			FE_i	$\lvert FE_i \rvert$
2009	1	1	1	58	58	36.06	1.608	1.391	50	8	8
	2	2	4	33	66	48.20	0.685	0.719	35	-2	2
	3	3	9	35	105	60.34	0.580	0.747	45	-10	10
	4	4	16	94	376	72.48	1.297	1.193	86	8	8
2010	1	5	25	97	485	84.62	1.146	1.391	118	-21	21
	2	6	36	82	492	96.76	0.847	0.719	70	12	12
	3	7	49	111	777	108.90	1.019	0.747	81	30	30
	4	8	64	110	880	121.04	0.909	1.193	144	-34	34
2011	1	9	81	189	1,701	133.18	1.419	1.391	185	4	4
	2	10	100	91	910	145.32	0.626	0.719	104	-13	13
	3	11	121	101	1,111	157.46	0.641	0.747	118	-17	17
	4	12	144	233	2,796	169.60	1.374	1.193	202	31	31
Total		78	650	1,234	9,757					-4	190
Average		6.50		102.83							
The estimated slope coefficient*				12.14			Linear regression formula		$\hat{y} = \hat{a}x + \hat{b} = 12.14 \times x + 23.92$		
The estimated intercept term*				23.92							
Mean forecast error (MFE)*				-0.33							
Mean absolute deviation (MAD)*				15.83							

Note

*: Round figures

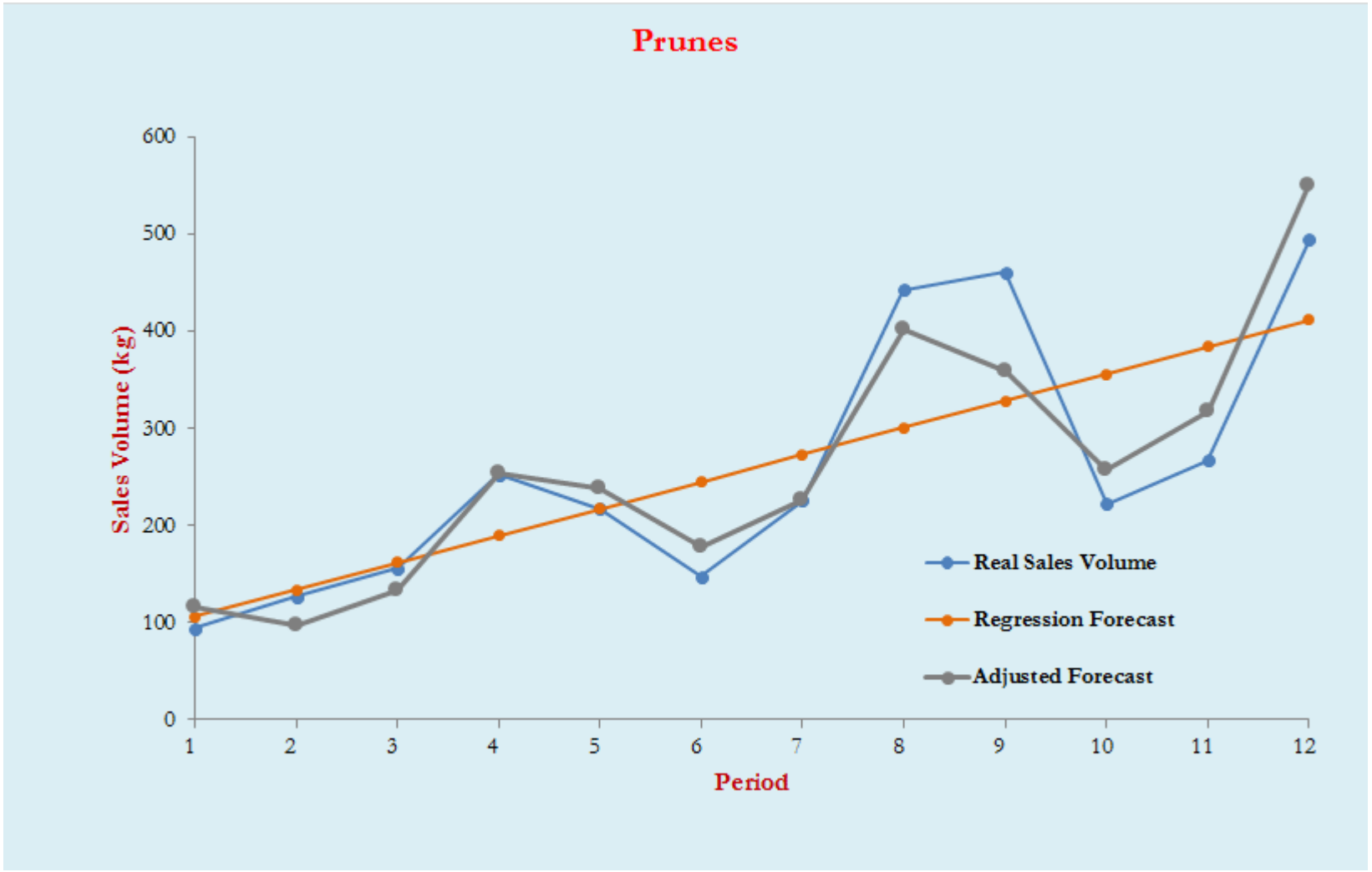

Macadamia 1
Sales Volume (kg)
250
200
150
100
50
0
1
2
3
4
5
6
7
8
9
10
11
12
Period
Real Sales Volume
Regression Forecast
Adjusted Forecast

Prunes

Time Series				Prunes							
Year	Quarter	Period	x^2	Sales Volume* (kg)	xy	Regression Forecast (kg)	Ratio	Sesonal Index	Adjusted Regression Forecast* (kg)	Forecast Error	Absolute Deviation
		x, i		y		$\hat{y}$	$(y/\hat{y})$			FE_i	$\lvert FE_i \rvert$
2009	1	1	1	94	94	106.54	0.882	1.094	117	-23	23
	2	2	4	127	254	134.29	0.946	0.725	97	30	30
	3	3	9	156	468	162.04	0.963	0.829	134	22	22
	4	4	16	253	1,012	189.79	1.333	1.336	254	-1	1
2010	1	5	25	217	1,085	217.54	0.998	1.094	238	-21	21
	2	6	36	148	888	245.29	0.603	0.725	178	-30	30
	3	7	49	226	1,582	273.04	0.828	0.829	226	0	-
	4	8	64	443	3,544	300.79	1.473	1.336	402	41	41
2011	1	9	81	461	4,149	328.54	1.403	1.094	359	102	102
	2	10	100	223	2,230	356.29	0.626	0.725	258	-35	35
	3	11	121	267	2,937	384.04	0.695	0.829	318	-51	51
	4	12	144	495	5,940	411.79	1.202	1.336	550	-55	55
Total		78	650	3,110	24,183					-21	411
Average		6.50		259.17							
The estimated slope coefficient*				27.75			Linear regression formula		$\hat{y} = \hat{a}x + \hat{b} = 27.25 \times x + 78.79$		
The estimated intercept term*				78.79							
Mean forecast error (MFE)*				-1.75							
Mean absolute deviation (MAD)*				34.25							

Note

*: Round figures


Prunes
Sales Volume (kg)
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
9
10
11
12
Period
Real Sales Volume
Regression Forecast
Adjusted Forecast