THE COMPARISON BETWEEN MARKOV ANALYSIS AND TREND ANALYSIS TO DETERMINE THE ALLOWANCE FOR DOUBTFUL ACCOUNT : A CASE STUDY ON SUKUN CIGARETTE COMPANY

A Thesis

Presented as Partial Fulfillment of The Requirements to Obtain The Bachelor Degree in Accounting Department

By

ARIEF ASHARI

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Student Registration Number : 96005510113031201O8

DEPARTMENT OF ACCOUNTING
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ABSTRACT

Ashari, Arief (2003). The Comparison Between Markov Analysis and Trend Analysis To Determine The Allowance for Doubtful account: A Case Study on Sukun Cigarette Company. Yogyakarta, Accounting Department. International Program. Economics Faculty. Universitas Islam Indonesia.

Sales credit entails cost and benefits. The main benefits are the boost in sales and profit. When a business sells items on credit, there is a chance that it will receive the payment owing at a later date. There are occasions when a business does not receive some or all of the payment owed. This may be because the debtor who owes the payment has been declared bankrupt and can not pay or there may have been some cheating practices. Whatever the reasons for the failure to pay, bad debts are hazardous for those who sells on credit.

The objective of the research is to recognize the most appropriate amount of allowance for doubtful account in the company to predict the bad debts that will occur. And to recognize which analysis is better between markov analysis, trend analysis, and fixed percentage of receivable which is applied by company in order to predict the bad debts that will occurs.

Sukun cigarette company is the research object. And it will have a benefit since the research is comparing markov analysis, trend analysis, and fixed percentage of receivable which is applied by company. One will be chosen which has the closest amount with bad debt

The statistic method to test the hyphothesis is the t test. This t test used 3 year data (1999– 2001) and level of significant (α) = 5%.

1. Testing between percentage of allowance for doubtful account in the company and percentage of bad debt that actually happened
   Ho (1) is accepted if $-4.303 \leq t \leq 4.303$
   Hi (1) is rejected if $t > 4.303$ or $t < -4.303$
   Result: $14.919 > 4.303$, then Ho (1) is rejected
2. Testing between percentage of allowance for doubtful account based on markov analysis with the percentage of realization of bad debt
   Ho (2) is accepted if $-4.303 \leq t \leq 4.303$
   Hi (2) is rejected if $t > 4.303$ or $t < -4.303$
   Result: $-4.303 \leq -0.02248 \leq 4.303$, then Ho (2) is accepted
3. Testing between percentage of allowance for doubtful account based on trend analysis with percentage of realization of bad debt
   Ho (3) is accepted if $-4.303 \leq t \leq 4.303$
   Hi (3) is rejected if $t > 4.303$ or $t < -4.303$
   Result: $9.38 > 4.303$, then Ho (3) is rejected.

The conclusion that can be drawn is markov analysis can be use as another methods to determine the amount of allowance for doubtful account

ABSTRAK

Arief ashari (2003). Perbandingan Antara Markov Analisa Dan Trend Analisa Dalam Penentuan Cadangan Kerugian Piutang: Studi Kasus Pada Perusahaan Rokok Sukun. Program Internasional. Fakultas Ekonomi. Universitas islam indonesia.

Pada penjualan secara kredit terdapat biaya dan manfaat. Manfaatnya adalah meningkatkan penjualan dan keuntungan. Pada penjualan secara kredit terdapat kemungkinan bahwa hutang tersebut akan diterima kemudian hari. Terdapat kemungkinan bahwa sebagian atau bahkan semua hutang tidak dapat tertagih. Hal ini dapat terjadi karena debitur dinyatakan bangkrut dan tidak dapat membayar. Atau ada kecurangan yang dilakukan debitur. Apapun alasannya kerugian piutang adalah ancaman untuk penjualan secara kredit.

Tujuan penelitian adalah menentukan jumlah cadangan kerugian piutang pada perusahaan yang sesuai dengan kerugian piutang yang terjadi. Dan juga menentukan analisa yang paling sesuai antara analisa markov, trend analisa dan cadangan kerugian yang diterapkan perusahaan untuk memperkirakan berapa kerugian piutang yag akan timbul.

Perusahaan rokok sukun adalah obyek dari penelitian ini. Dan akan mendapat manfaat dari penelitian yang membandingkan analisa markov, trend analisa dan cadangan kerugian yang diterapkan perusahaan untuk mendapatkan hasil yang paling mendekati kerugian piutang.

Metode statistik untuk menguji hipotesa adalah uji t. uji t ini menggunakan data selama 3 tahun (1999-2000) dan derajat kepercayaan (α) = 5%.
Dibawah ini adalah hipotesa penelitian:

1. Pengujian antara persentase cadangan kerugian piutang yang diterapkan perusahaan dengan persentase realisasi piutang yang tidak tertagih.
   Ho (1) diterima apabila $-4.303 \leq t \leq 4.303$
   Hi (1) ditolak apabila $t > 4.303$ or $t < -4.303$
   Hasil : $14.919 > 4.303$, maka Ho (1) ditolak.
2. Pengujian antara persentase cadangan kerugian piutang analisa markov dengan persentase realisasi piutang yang tidak tertagih.
   Ho (2) diterima apabila $-4.303 \leq t \leq 4.303$
   Hi (2) ditolak apabila $t > 4.303$ or $t < -4.303$
   Hasil : $-4.303 \leq -0.02248 \leq 4.303$, maka Ho (2) diterima.
3. Pengujian antara persentase cadangan kerugian piutang trend analisa dengan persentase realisasi piutang yang tidak tertagih.
   Ho (3) diterima apabila $-4.303 \leq t \leq 4.303$
   Hi (3) ditolak apabila $t > 4.303$ or $t < -4.303$

Dapat ditarik kesimpulan bahwa analisa markov dapat dijadikan cara lain dalam penentuan cadangan kerugian piutang.

CHAPTER I
INTRODUCTION

1.1 Study Background

In facing a free competition, companies are demanded to manage their business prudently and make a financial decision in an accurate way. Account receivable needs a special attention among the company activity in managing their business. This activities has a relation in a way to expand sales. Sales on credit is one of the ways that companies do to increase sales. Companies send some goods based on the order and for a certain period they have a receivable on the debtor.

An easy way to have credit and have a time period of credit payment will increase the credit sales. But it has an implication in the increasing of credit risk which is unpaid debt. Credit risk might happened if the company is not prudent in estimating the credibility of the credit applicant and other factors which can not be controlled like the death of the debtor, disaster, customer's bankruptcy, etc. Based on these consideration the disclosure of receivables on the financial statement, it does not only show only the gross amount of that receivables. On PSAK, stated that:

> "Piutang dinyatakan sebesar jumlah kotor tagihan dikurangi dengan taksiran jumlah yang tidak dapat ditagih. Jumlah kotor piutang harus tetap disajikan pada neraca diikuti dengan penyisihan untuk piutang yang diragukan atau taksiran jumlah yang tidak dapat dit

From the above statement it is necessary to predict the amount of receivables that can be collected and uncollected amount as a reduction of

From the above statement it is necessary to predict the amount of receivables that can be collected and uncollected amount as a reduction of receivables shown in the balance sheet. The portion of uncollected receivables is called allowance for doubtful account. An error in determining the amount of allowance for doubtful account will caused the amount of the cash realizable value of the accounts receivable shown in balance sheet and sales revenue in the income statement not describing the real fact.

There are two methods in determining allowance for doubtful account namely direct write-off method and allowance method. Theoretically both method will almost resulting the same amount, if the estimation is right. But in the reality, it is complicated. For that reason the method used is an estimation method that will give an accurate or precise number. There are another methods to determine the allowance for doubtful account, which are markov analysis and trend analysis. Finally between two methods there will be one method which is recommended to determine the allowance for doubtful account. Markov analysis considered the receivable classification and also considered the behavior of debtor to pay their debt. While trend analysis consider the movement in time series, generally is performed using annual data. With the use of Markov analysis or trend analysis, it will be expected to determine the amount of receivable that will become bad debt more precisely.

The definition of markov chain analysis is stated by Levin (1986;746),"Markov analysis is a method of analyzing the current behavior of some variables in an effort to predict the future behavior of that same variable."

While trend can be used to aid in the interpretation of historical value and to forecast future value.

1.2 Problem Identification

Markov analysis and trend analysis is an alternative way in predicting the future bad debt expense. This thesis is focusing in the comparison between markov analysis and trend analysis to apply in a company to determine the amount of allowance for doubtful account in the next period.

1.3 Problem Formulation

After having an understanding of the background, the problem that needs to be solved in this research is what method to determine the amount of allowance for doubtful account which is closely to the amount of bad debt.

1.4 Limitation of Research area

In order to give answer to the existed problem and considering the time and cost limitation in conducting this research, the discussion is focused mainly on the trade receivables. The trade receivables and allowance for doubtful that will be analyzed is from year 1999 until 2001. The method that is compared in this research is Markov analysis and trend analysis.

1.5 Research Objective

The objective of the research is to recognize the most appropriate amount of allowance for doubtful account in the company to predict the bad debt that will occur. And to recognize the most appropriate analysis between markov analysis and trend analysis to predict the bad debt that will occur.

1.6 Research Benefit

Beside the objective that has been mentioned above hopefully this research will contribute for the company as follows :

a. As a company's consideration to determine the amount of allowance for doubtful account that will become a bad debt more precisely.

b. As a company's comparison in evaluating the allowance for doubtful account policy.

1.7 Definition of Terms

In order to give an understanding about this thesis, a definition of terms that related to this thesis is given below. Hopefully after reading this definition the reader will understand this thesis. The terms are as follows:

a. Comparison is comparing one method with another.

b. Markov analysis is a method of analyzing the current behavior of some variables in an effort to predict the future behavior of that same variables (Levin. Richard, 1986:746).

c. Trend is a line or a curve showing a general tendency (Bowen and Starr, 1988:629).

d. Determining is a way to reach a decision about something after a consideration and investigation.

e. Allowance is the amount by which something is allowed to be more or less than stated.

f. Doubtful is not clearly predictable, uncertain, unsure.

g. Account is a record of financial transaction relating to specific person business, etc.

h. A case study is a direct observation process conducted in one company or more in order to obtain the data needed. Through the data the researcher can make the report of data finding, analysis, and conclusion.

1.8 Review of Related Literature

Markov analysis is a technique of dealing with the probabilities of future occurrences by analyzing presently known probabilities. This procedure was developed by Russian mathematician Andrei A. Markov early in this century. He first used it to describe and predict the behavior of particle of gas in a closed container. As a management tool, Markov analysis has been successfully applied to a wide variety of decision situations. Perhaps its widest use is in examining and predicting the behavior of consumers in terms of their brand loyalty and their switching from one brand to another. Another interesting application of Markov

analysis has been to study of the life of newspaper subscriptions. A more recent application of this technique has been to the study of account receivable behavior, that is, to the study of customers as they change from "current account," through "30 days overdue," to "60 days overdue," and then to "bad debt." In each of these applications, the management is interested in predicting what the future will bring (number of bad debt, for example, in account receivable application) by analyzing what the current behavior is (propensity of customers to move from current account to various past due categories).

1.9 Hypothesis Formulation

In this research the proposed hypothesis are as follows :

a. Markov analysis hypothesis.

a.1. There is a significant difference between the result of allowance for doubtful account in the trade receivables according company's method and the realization of the trade receivables that can not be collected or become bad debt.

a.2. There is no significant difference between the result of allowance for doubtful account according Markov analysis with the realization of the trade receivables that can not be collected or become bad debt.

b. Trend analysis hypothesis

b.1. There is a significant difference between the result of allowance for doubtful account in the trade receivables according company's method and the realization of the trade receivables that can not be collected or become bad debt.

b.2. There is no significant difference between the result of allowance for doubtful account according trend analysis with the realization of the trade receivables that can not be collected or become bad debt.

By using these hypothesis, it can be found whether the allowance for doubtful account which is attained from Markov or trend analysis is more realistic or not. And for the company to determine whether the markov or trend analysis can be used in predicting the allowance for doubtful account in the next period.

1.10 Research Method

In writing this thesis, some data are needed to be analyzed, they are as follows:

1. Data From Company

a. Data of allowance for doubtful account which has been applied by the company from period 1999 until 2001.

b. Data of uncollectible trade receivables or bad debt from period 1999 until 2001.

c. Trade receivables amount with accordance aging schedule from period 1999 until 2001.

d. Transition of matrix which describes the probabilities of the debtor in fulfilling their obligation.

2. Methods of Data Collection

a. Interview.

Interviewing the persons who are in charge of company's trade receivable.

b. Observation.

By having direct observation concerning the research object.

3. Data Analysis

a. Markov process

After receiving the data of the company, they are analyzed using some Markov analysis computation. The software used is math cad 2000 to compute data concerning with matrix such as in matrix subtraction, inverse of matrix and matrix multiplication. The step for computing data are:

1. To classify trade receivables based on their aging period.

   Classification of trade receivables based on aging period is aimed to recognize the overdue unpaid bill, such as overdue 30 days, overdue 90 days or become bad debt.

2. To recognize the probability of debtor behavior in paying their debt.

   Receivable subsidiary ledger is traced to find out how is the probability of debtor change from one category of aging receivable period to other category in the certain period. This step is also aimed to recognize the probabilities of debtor to pay their debt and the probabilities of unpaid debt.

3. To construct transition of matrix and partition of matrix.

Transition of matrix is a matrix which has the same number of rows and number of columns. The sum of each matrix row has to be equal one. The numbers in row shows the probability of customer to move among the classification.

Matrix partition is a sub matrix from transition of matrix. In this step, transition of matrix is divided into four matrices. The division of matrix transition known as matrix partition is shown like this:

aij	aij	aij	aij
	I		O
aij	aij	aij	aij
aij	aij	aij	aij
	R		Q
aij	aij	aij	aij

where:

I = Matrix identity (partition of matrix)

O = A matrix with all Os.

R = Partition of matrix.

Q = Partition of matrix.

aij = Probability of customer to move among the classification from one time period to the next period.

4. The next step is deducting matrix Q from an identity matrix.

5. Find the inverse of matrix partition.

   The fundamental matrix (N) is found by inversing matrix partition from deduction between matrix I and matrix Q.

6. Multiplication of matrix vector.

   In the Markov analysis, to determine the estimation of receivable that will be paid off and the estimation of receivable that will be uncollectible by multiplying the N by matrix R, then multiplying NR with a row vector, such as B. A row vector is a matrix that consists of just one row. It shows the total amount of receivable in each category. The result of multiplication of row vector B by matrix NR indicates the amount of receivable which is likely to be paid and amount of receivable which is likely to become bad debt.

   Mathematically the steps shown above can be generated in the formula as follow:

   $A = B \times N \times R$ (Swasta, 1988: 300)

   Where:

   $N = (1-Q)^{-1}$

   A = Matrix which shows the amount of receivable will likely to be paid and receivable that will become bad debt.

   B = Vector matrix which is indicates the total amount of receivable which is not paid in each category.

   N = Fundamental matrix.

   I = Identity matrix.

   Q,R = Square matrices which contains the whole probabilities of being in one condition to the other condition in next period.

b. Trend analysis.

Trend analysis can be used to aid in the interpretation of historical value and to forecast future value.

$$Y_t = b_o + b_1 X$$

$$b_1 = \frac{\Sigma XY - n\overline{X}\overline{Y}}{\Sigma X^2 - n\overline{X}^2}$$

$$b_0 = \overline{Y} - b_1 \overline{X}$$

$$\overline{Y} = \frac{\Sigma Y}{n}$$

$$\overline{X} = \frac{\Sigma X}{n}$$

Where:

bo = value of Yt in year 0.

b1 = rate of growth.

c. T test.

In general, statistic uses t test as a basis in decision making to determine whether the difference between a variable with a small sample size is significant or not.

The t test is used to determine whether there is a significant difference between allowance for doubtful account that the company has estimated and the bad debt that actually happened.

The formula used for the test are as follow:

$$\overline{X} = \frac{\Sigma X}{n}$$

$$SD = \sqrt{\frac{\Sigma(X - \overline{X})^2}{n-1}}$$

$$tc = \frac{\overline{X}}{SD/\sqrt{n}}$$

Where :

X = Data

$\overline{X}$ = Mean

SD = Standard deviation

N = Number of data

tc = Test of compliance

To determine whether there is a significant difference or not between allowance for doubtful account that the company had estimated with the real bad debt, between allowance for doubtful account from markov analysis with the real bad debt, and between allowance for doubtful account from trend analysis with the real bad debt the level of significant (α)= 5% with random sample n = 3 is used.

Critical value = ($\alpha \div 2$; n -1)

Where:

α = Level of significant

n = Number of data (year)

Critical value based on the t distribution table is ± 4.303.

Based on t test above, the difference of allowance for doubtful account according company method with the real bad debt is significant if $t > 4.303$ or $t < -4.303$ and not significant if $-4.303 \leq t \leq 4.303$. For the difference of allowance for doubtful account according markov analysis with real bad debt are significant if $t > 4.303$ or $t < -4.303$ and not significant if $-4.303 \leq t \leq 4.303$. For the difference of allowance for doubtful account according trend analysis with real bad debt are significant if $t > 4.303$ or $t < -4.303$ and not significant if $-4.303 \leq t \leq 4.303$.

CHAPTER II
THEORETICAL FRAMEWORK

2.1 Definition of Receivable

Receivable are claims held against customers and others for money, goods or services (Kieso and Weggandt; 8th ed, 1995,325). Whereas according Charles T. Horgran and Waller T. Harrison Jr. defined receivables as monetary claims against businesses and individuals. They are acquired mainly by selling goods and by lending money.

Receivable own by company mostly comes from sales transaction, rendering services, sales of securities, et cetera.

2.1.1. The Classification of Receivable

Receivable may arise from many sources, but mostly arise from goods sales or rendering services. Basically receivable own by company can be classified as:

1. Sources of receivable
2. For financial statement purpose

According the sources of receivables, can be classified as:

1. Trade receivable arises from sale of goods or services on account.
2. Non trade receivable arise from variety of transactions and can be written promises either to pay as to deliver.

10/13/03For financial statement, receivable can be classified as:

1. Current receivable is all receivables identified as collectable within one year or normal operating cycle.
2. Non current receivable is all receivable identified as collectible more than one year.

2.2 Recognizing of Trade Receivables

Trade receivable is the receivable arising from sale of goods and services rendered by company. In normal activity of company, usually trade receivable will be paid within less than one year, so that it is classified in current assets.

The recognition of receivable is related to the recognition of revenue. Since revenues are generally recognizing when the earning process is complete and cash is realized or realizable, it follows that a receivable arising from the sale of goods is generally recognizing when title to the goods passes to the buyer. In the intermediate accounting 6^{th} edition, there are two kinds of terms goods passes to the buyer, which are:

1. Free on board shipping point, legal title and the responsibilities of ownership, pass to the buyer when the seller delivers the goods to the shipping agent.
2. Free on board destination, the goods belong to the seller until they are delivered to their destination by shipping agent

And receivables for service to customer are properly recognized when the services are performed.

2.3 Valuation of Trade Receivable

The problem of valuation of trade receivable directly related to the amount of sales revenue that can be realized into cash. The valuation of trade receivable has to consider these problems:

1. The amount of receivable that can be charged to the buyer

   There are various elements that make not all amounts in credit sales transaction can be charged to the customers or buyer. The element that makes not all of sales price (agreed on) can be charged to the customer on buyer has to be considered as a deduction to sales revenue.

   The elements that must be dedicated form the sales revenue in changing the amount owed to the buyer are:

   a. Trade Discount

      Is the difference between gross sales prices and an amount designated as a trade discount. It is given if buyer buys the goods exceed certain quality.

   b. Cash Discount

      A reduction given by a seller for prompt payment of credit sale

   c. Sales Return and Allowance

      The customers may return the goods to the seller or may choose to keep the merchandise if the seller is willing to grant an allowance (deduction) from the selling price. A customer may return because the goods are damaged, of inferior quality, or not in accord with the customer's specifications.

2. The collectible and duration which is needed to realize that receivable into cash.

The trade receivable will not entirely can be realized into cash, there are still various factors causing that happening. Because of time, there is possibility of customer unable to pay it or even all of their debts. Its causes the income statement, which determine by matched the expenses incurred in the earning process with the revenues will be overstated. That is why all factors which caused the sales revenue can not realized into cash should be considered in the process of income statement making even though its only an estimation.

Trade receivable as an assets which come from sales transaction not depict its ability as economic source own by company, if the receivable still reported at "gross". Because of time there is possibility of customer unable to pay some or all of their debits. This is the company's risk as a This is the company's risk as a ere is possibility cost incurred to realize the sales revenue in trade receivable into cash in the future. This is have to be considered by company.

2.4 Estimating Uncollectible Receivable

Because receivables related to the future events, there is possibility of receivable charged to the customer will be not paid all. An uncollectible trade receivable is a loss of revenue that requires through proper entry in the accounts.

There are two methods in recording uncollectible (Kieso and Weggandt; 8th ed, 1995,328):

1. Allowance method

   In this method in every year-end, the company determines the estimation amount of uncollectible receivable. This estimation is considered as an expense and as a reduction on the amount of trade receivable in the period in which the sale is recorded.

   There are two approaches in estimating the amount of uncollectible, which are percentage of sales and percentage of receivables.

   a. Percentage of sales (income statement) approach

      The percentage of sales approach sometimes is called an income statement because it emphasizes matching uncollectible accounts expense against current revenue. The estimate for uncollectible accounts may be based on sales for the period or the amount of receivables outstanding at the end of the period. When a sale basis is used, the amount of uncollectible accounts in past years relative to total sales provides a percentage of estimated uncollectible. This percentage may be modified by expectations based on past experiences, present market conditions and an analysis of the outstanding balances. If a customer whose account has been written off will pay all or portion of previously owed. When this happens, the customer's account should be restored by debiting accounts receivable and crediting the allowance account for the amount to be

receivable. Then cash should be debited and accounts receivable credited for the amount receivable.

b. Percentage of receivables (balance sheet) approach

Instead of using a percentage of sales to estimate uncollectible accounts, the company may based their estimates on a percentage of total accounts receivable outstanding. This method emphasizes the relationship between the account receivable balance and the allowance for doubtful accounts. There is other procedure in percentage of receivable which is aging schedule. This procedure is based on the assumption that the longer a receivable is outstanding, the less likely it is to be collected. Individual accounts are analyzed to determine those not yet due and those past due. Past due accounts are classified in terms of the length of the period past due. The two procedure that adjust the allowance account to a desired ending balance are some times called balance sheet approach because both emphasize valuation of receivable at net realizable value on the balance sheet.

2. Direct write off method

This is the simplest method for recognizing the loss from uncollectible accounts. It just to debit uncollectible accounts expense and credit accounts receivable at the time it is determined that an account can not be collected. This method use is considered not appropriate, because this method does not provide for the matching of current revenues with

related expenses and does not report receivables at their net realizable value.

2.5 Markov Analysis to Determine The Allowance for Doubtful Account

Markov analysis is a method of analyzing the current behavior of same variables in a effort to predict the future behavior of that same variables (Quantitative Approaches to Management; Levin; Rubin; Stinson; 1992:802). Markov analysis was developed by the Russian mathematician, A.A. Markov, A.A. Markov, R.M Cyert, H). Danielson and G.L Thompson was introduced first time usage of Markov analysis to determine the allowance for doubtful account.

Markov analysis is included in determination of allowance for doubtful account based on certain percentage of trade receivable in end balance.

The writer uses the software of Math cad 2000 for the calculation of data related to matrix: matrix reduction, matrix inverse and matrix multiplication.

In this calculation Markov analysis use the following matrix calculation:

1. Transition Matrix

In determining the level of allowance for doubtful account using Markov analysis, the first step is determine transition probability and make in the form of transition matrix.

Transition Matrix obtained from observation to receivable subsidiary ledger which has been classified according to certain age. In

this process, we used assumption that probability of transition matrix from receivable classification will be measured based on same time period.

Following is the way of making of transition matrix based on the observation to subsidiary ledger receivable which have been classified according to certain age.

Debtor's behavior probabilities:

- Current period

  92 % paid

  8 % overdue 1 – 3 months

- Overdue 1 – 3 months

  82 % paid

  18 % overdue 4 – 6 months

- Overdue 4 – 6 months

  72 % paid

  28 % overdue 7 – 9 months

- Overdue 7 – 9 months

  47 % paid

  53 % overdue 10 – 12 months

- Overdue 10 – 12 months

  33 % paid

  67 % overdue > 12 months

- Overdue > 12 months

7 % paid

93 % becomes uncollectible receivable

The matrix transition can be formed from these debtor behavior probabilities, this is as follows:

Matrix Transition of

Probability of Debtor Behavior

From/to	I	II	1	2	3	4	5	6
I	1	0	0	0	0	0	0	0
II	0	1	0	0	0	0	0	0
1	0.92	0	0	0.08	0	0	0	0
2	0.82	0	0	0	0.18	0	0	0
3	0.72	0	0	0	0	0.28	0	0
4	0.47	0	0	0	0	0	0.53	0
5	0.33	0	0	0	0	0	0	0.67
6	0.07	0.93	0	0	0	0	0	0

Where:

I = Receivables which are paid

II = Receivables which are not paid or become bad debt

1 = Current period

2 = overdue 1 – 3 months

3 = overdue 4 – 6 months

4 = overdue 7 – 9 months

5 = overdue 10 – 12 months

6 = overdue > 12 months

2. Matrix Partition

From the matrix transition above it can be found the partition of matrix I, Q, R, O as shown below:

a. Identity matrix (I) with 2 x 2 ordo

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

b. Zero matrix (0) with 2 x 6 ordo

$$O = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

c. R Matrix with 6 x 2 ordo

$$R = \begin{bmatrix} 0.92 & 0 \\ 0.82 & 0 \\ 0.72 & 0 \\ 0.47 & 0 \\ 0.33 & 0 \\ 0.07 & 0.93 \end{bmatrix}$$

d. Q Matrix with 6 x 6 ordo

$$Q = \begin{bmatrix} 0 & 0.08 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.18 & 0 & 0 & \\ 0 & 0 & 0 & 0.28 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.53 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0.67 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

3. Subtraction of Matrix (I – Q)

The value of identity matrix is not change even though the matrix rows and columns changed. Matrix I should be change into 6 x 6 ordo in order it can be subtracting with Q matrix.

$$I - Q = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 0 & 0.08 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.18 & 0 & 0 & \\ 0 & 0 & 0 & 0.28 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.53 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0.67 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -0.08 & 0 & 0 & 0 & 0 \\ 0 & 1 & -0.18 & 0 & 0 & 0 \\ 0 & 0 & 1 & -0.28 & 0 & 0 \\ 0 & 0 & 0 & 1 & -0.53 & 0 \\ 0 & 0 & 0 & 0 & 0 & -0.67 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

4. Inverse of Matrix Partition

N matrix is found by inversing matrix partition from the subtraction of matrix partition I with matrix partition Q.

5. Multiplication of Matrix Vector

In markov analysis, to estimate the amount of receivable that will be paid and the amount will be bad debt can be found by multiplying NR matrix with B matrix.

Multiplication of B matrix with NR matrix will shows the amount of receivable that will be paid and the estimation of allowance for doubtful account.

Multiplication matrix B with matrix NR shown as:

$$BNR = (X_{11}, X_{12}.....X_{1n}) \begin{bmatrix} b11 & b12 \\ bn1 & bn2 \end{bmatrix}$$

Where:

$(X_{11}, X_{12}....X_{1n})$ is matrix of trade receivable which has classified based on certain age period.

$$\begin{bmatrix} b11 & b12 \\ bn1 & bn2 \end{bmatrix} \text{is NR}$$

(PY) is multiplication result which shown the estimation amount that will be paid (P) and the estimation amount that will not paid (Y).

2.6 Trend Analysis

Trend is a time series displays a steady tendency of increase or decrease through time (Amir D. Aczel, 4th ed; 1999; 603). Trend refers to data depending on time. Therefore, trend is also called historical data.

Data classified on the basis of intervals of time constitute vital information in the control of business activity, since this is showing the changes that are taking place in a business. The problem of measuring change is company activity is the making forecast of future activity. The management of company is requires a continual making of decisions regarding the future; and the basis for such forecast is the record of past performance.

The writer uses the method of least squares to find the trend value concerning the data. D.M. Mithani (1980 : 190) showed that the method of a least squares is the most scientific truly representative method of obtaining trend values by mathematical device.

Below is the equation for the trend line values with X representing the year: (Leonard J. Kazmien Theory and Problems of Business Statistic, 3rd ed, 1996, 283)

$$Yt = bo + b_1X$$

$$b_1 = \frac{\sum XY - n\,\overline{XY}}{\sum X^2 - n\,\overline{X}^2}$$

$$bo = Y - b_1\,\overline{X}$$

$$\overline{Y} = \frac{\sum Y}{n}$$

$$\overline{X} = \frac{\sum X}{n}$$

Where:

bo = value of Yt in year 0

b_1 = rate of growth

2.7 t Test

The t test is used to determine whether there is a significant difference between allowances for doubtful account that the company has estimated and with the percentage of bad debt that actually happened. Second allowance for doubtful account based on markov analysis and with percentage of bad debt that actually happened, third is to test the allowance for doubtful account based on trend analysis and with percentage of bad debt that actually happened. This t test also aimed to choose which one between three alternatives of methods in determining the allowance for doubtful account most suitable for the company. This t test used 3 year data (1999 – 2001) and level of significant (α) = 5%.

situation, all this things made his business developed. Now his workers are becoming thousands, many kinds of cigarettes in various price with Sukun branded are produced to fulfill the market necessity (for Java island – North Sea).

3.2. Company's Organizational Chart

Organization is needed in a company since there is member's necessity to work together in reaching the company's purpose and the members' purpose. Organizational chart is needed by company in operating its business, either small company or big company. It has the purpose to create harmonious relationship between employees, so the company's purpose will be easier to be reached. Its aim is to make the distribution of labor, authority and responsibility easier.

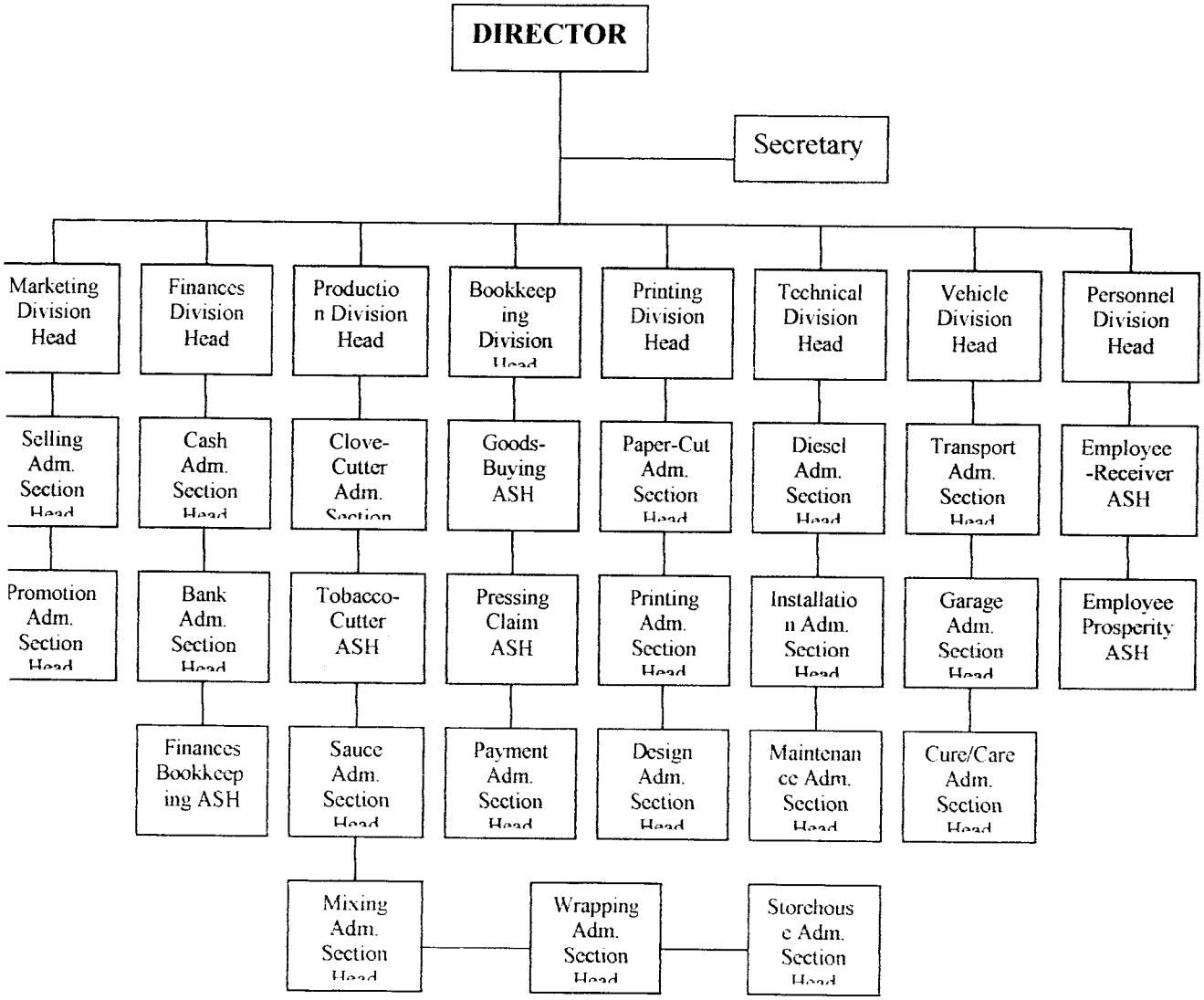
By the organizational chart, subordinates will know to whom he/ she must responsible his/ her work. The director makes organizational chart that explains the duty and responsibility from the director to subordinates, also all the order and relation among organization elements. Because of the big duty and responsibility of the director, some of his functions are delegated to division head. Organizational chart in Sukun Cigarette Company is in the form of line, the authority flows from the superior to the subordinate who is one lever under him. On the other hand, subordinate is responsible to superior who is one level above him.

For the clear explanation, organizational chart of Sukun Cigarette Company can be seen below:

FIGURE 3.1

ORGANIZATIONAL CHART ON

SUKUN CIGARETTE COMPANY



The job description of every division is as follows:

A. Director

The leader of the company is very important because he is the major and the motor of the management.

The director's authorities:

- Making a decision to all main policies, intern and extern of the company
- Controlling the operational of the company
- Holding the largest and highest authority & responsibility in the company
- Coordinating all the divisions in the company

B. Secretary

A secretary should know the characteristics and preferences of the director; she also has to know kinds of letter format, should be able fluent in speaking and typing.

The secretary's jobs:

- Assisting the director
- Arranging letters, making notes in meeting
- Arranging meetings
- Becoming a mediator between the director and subordinates

C. Marketing Division Head

The responsible person in marketing and management.

- Selling Adm. Section Head's job:

Selling products based on the Marketing Division Head's policy

- Promotion Adm. Section Head's job:

  Promoting products based on the Marketing Division Head's policy

D. Finance Division Head

The duties are:

- Giving salary and wages to the workers
- Determining the limit of cash in the company
- Holding and managing the fund for the operational of the company

E. Production Division Head

The responsible person in processing and controlling the production

- Clove-Cutter Adm. Section Head's job:

  Processing clove based on the Production Division Head's policy

- Tobacco Cutter Adm. Section Head's job:

  Processing tobacco based on the Production Division Head's Policy

F. Bookkeeping Division Head

Its main jobs are:

- Making a note and processing the transaction of the company regularly
- Counting up the company's profit in certain period
- Determining the company's property, debt and capital every time
- Making financial statement at the end of fiscal year.

G. Printing Division Head

The duties are:

- Printing "SUKUN" trademarks

- Making calendar every year
- Accepting orders from the outside

H. Technical Division Head

The duties are:

- Repairing broken machines.
- Maintaining all machines in the company.

I. Vehicle Division Head

The duties are:

- Investigating vehicle for the visiting agencies.
- Preparing vehicle for the company's necessity.
- Cooperating with the technical part in order to meet the company's need.

J. Personnel Division Head

The management function is closely related with drawing, placement, training and developing.

The duties are:

- Evaluating position.
- Recruiting workers.
- Managing letters circulation in the company.
- Determining wages and promotion in position.

3.3. Company's Activity

Sukun Cigarette Company is one of the company among the other companies, which produces clove-flavored cigarette and filter cigarette. Most of the workers are women (88%). Since carefulness and patience are needed in making cigarette, the company prefers women than men to be employed.

The workers are divided into three:

A. Contract workers; consist of cigarette-milling workers, wrapping workers and package workers.
B. Daily workers; consist of sorting workers, tobacco-milling workers, clove-cutting workers.
C. Monthly workers; consist of division head and administration staff.

The working hours of Sukun Cigarette Company starts from 07.00 am to 03.00 pm, the break is 90 minutes from 12.00 am to 01. 30 pm. The working days are Saturday, Sunday, Monday, Tuesday, Wednesday and Thursday. The holidays are on Friday and Holy days, also every Wednesday *Kliwon* and Thursday *Pon* , the days when Mr. Mc Wartono and Mrs. Mc Wartono passed away.

3.4. Company policy which related on receivables.

In setting up a policy, management always guided by regulations on the company. In company policy related whit accounting, the company guided by Standar Akuntansi Keuangan (SAK), that company categories their receivables in line which are trade receivables and non trade receivable.

Company computing the estimation amount of uncollectible of receivable to reduce the amount of trade receivable in balance sheet. According company's policy, the estimation amount of allowance for doubtful account is calculated with fixed percentage of trade receivable balance at end period.

Estimation amount of uncollectible receivable then put into account of allowance for doubtful account. This account will reducing the amount of receivable in balance sheet, so that company can presented the net realizable amount of receivable in the balance sheet.

3.5. The Product and Production Process.

The products of Sukun Cigarette Company are:

1. Sukun King Size 10 cigarettes
2. Sukun King Size 12 cigarettes
3. Sukun Filter Special 12 cigarettes
4. Sukun Filter Special 16 cigarettes
5. Sukun Djaya 10 cigarettes
6. Sukun Filter Executive 12 cigarettes
7. Sukun Filter Executive 16 cigarettes
8. Sukun Abu-abu 10 cigarettes
9. Sukun Klobot Manis 6 cigarettes
10. Sukun Remaja 10 cigarettes
11. Sukun Orange 10 cigarettes

The materials needed in the production process are:

1. Basic material

   Tobacco is the main material in making the cigarette. It is taken from Temanggung, Weleri, Bojonegoro, Madura, Mranggen, Muntilan and imported tobacco.

2. Clove

   Clove is taken from Banyumas, Lampung, Ambon, Purwokerto, Bali, Manado, and imported from Zimbabwe.

3. Sauce

   Sauce is a substance that gives special taste and aroma in cigarette. It is taken from France, Germany, and the Netherlands.

4. Papier paper

   Papier paper is used to roll cigarette, it is imported from Japan and France.

In short, the production of Sukun cigarette passes the following steps:

A. Mixing

   Tobacco and clove that have been cut are mixed with certain proportion.

B. Rolling and Milling

   The mixing material is brought to the rolling part, and then the women workers do the rolling with 'batil' workers who cut the tip of tobacco cigarette (tidy up the cigarette).

C. Sorting Division

Selects the cigarette, whether it has met the standard or not. If it is out of standard, it will be returned to the rolling division in order to be rolled again until it fits the standard.

D. Wrapping/ Packing

Wrapping is filling every pack with 12 cigarettes. Workers in wrapping part put cigarette revenue stamps on the suitable place. Then the packages are sent to the pressing part. In this division the packages is categorized into 20 packs or *ngeslop*.

5. Carton Division

Wrapping the pressing cigarette into carton boxes, one carton box consists of 10 presses or 200 packs.

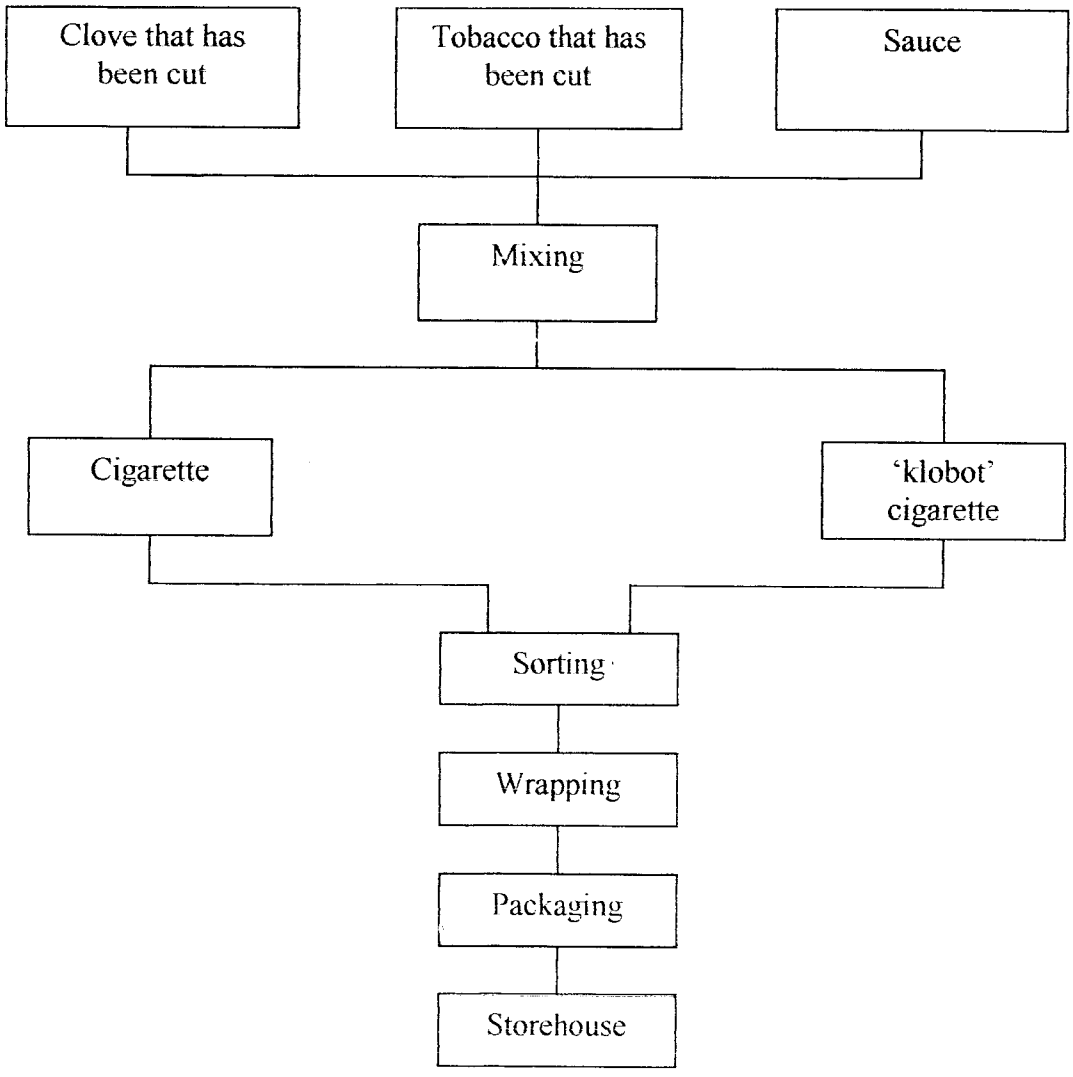
6. Storehouse Division

The boxes are sent to the storehouse and ready to be sold to agents.

FIGURE 3.2

PROCESS OF PRODUCTION OF

SUKUN CIGARETTE COMPANY KUDUS



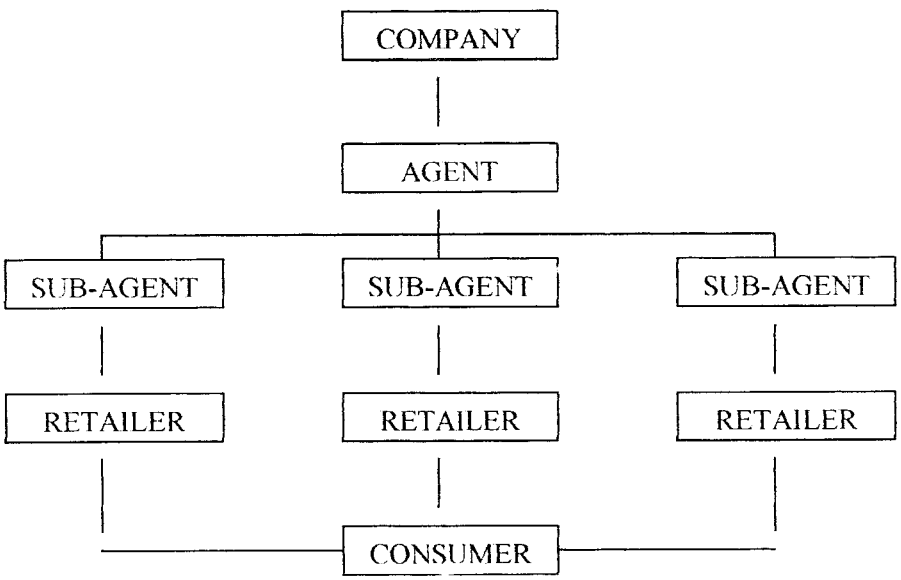
3.6. The Company's Marketing System

In marketing, Sukun Cigarette Company uses indirect marketing system. It is a system of marketing to the end consumer throughout the lines there, usually through an agent as the distributor. Sub agents that are easy to be reached by small agents help large agents. From sub agents the cigarette are sent to retailer and then to the end consumer.

FIGURE 3.3

DISTRIBUTION LINE OF

SUKUN CIGARETTE COMPANY



The marketing areas for this time are:

Java: Central Java (especially North Sea), Solo

West Java: Cirebon until Tasikmalaya, Sukabumi, Serang

East Java: North Sea, Jember and Malang

Out side of Java: North Sumatra, Lampung, Padang, Palembang, Jambi, Pekanbaru, Riau, Medan, Ujung Pandang, Manado, Banjarmasin, Bali, and Lombok

Foreign Country: Saudi Arabia

Besides giving good products to fulfill the consumer's taste, the company also holds routine promotion to increase the income of selling and to raise the trust of the consumer, such as:

1. Billboard advertisement
2. Newspaper and electronic advertisement
3. Exhibition stand
4. Holding community entertainment
5. Being a sponsor of an activity
6. Slide and cinema
7. Calendar distribution
8. Activity in order to promote Sukun products to consumer

CHAPTER IV
DATA ANALYSIS

The amount of allowance for doubtful account has to determine realistically with the bad debt happened. Data analysis in this research is using 3 methods to determine the allowance for doubtful account on Sukun Cigarette Company. The methods are using percentage of receivables (aging the receivables), markov analysis and trend analysis. From those methods, one will be chosen which has the realistic amount of allowance for doubtful account.

4.1 Allowance for doubtful account on Sukun Cigarette Company

Sukun Cigarette company sells their products by cash credit sales. Because of no certainty in trade receivable about the collection of receivables, Sukun Cigarette Company establishes allowance for doubtful account to anticipate the amount that will become bad debt.

Below is the trades receivable and allowance for doubtful account table for 3 years from 1999 until 2001.

Table IV.1

Trade Receivables and Allowance for doubtful account

With Fixed Percentage of Receivable

Year	Trade Receivables	Allowance for doubtful account	Percentage
1999	741.002.400	48.165.180	6,5%
2000	1.031.862.240	67.071.000	6,5%
2001	1.052.744.160	68.428.320	6,5%

Source: Sukun Company's Financial Statement

4.2 Trade Receivables Which Become Bad Debt

The allowance for doubtful account, which is determined at the end of a period basically is the estimation amount. Whether the allowance for doubtful account is based on fixed percentage of receivables, allowance for doubtful account is based on markov analysis and allowance for doubtful account is based on trend analysis all, of them are estimation amount.

Below is the table presenting the uncollectible receivables or bad debt on Sukun Cigarette Company.

Table IV.2

Uncollectible Receivable

(1999 – 2001)

Year	Trade Receivables	Percentage
1999	24.601.200	3,32%
2000	30.995.200	3%
2001	26.318.520	2,5%

Source: Trade Receivable Ledger of Sukun Company's Financial For period 1999 - 2001

4.3 Trade Receivables Amount Based On Aging Period

The data needed to determine the allowance for doubtful account based on markov analysis is the data on the amount of trade receivable according to aging period of receivable. Trade receivable are classified as from current account, 1 – 3 months overdue, 4 – 6 months overdue, 7 – 9 month overdue, 10 – 12 months overdue, then for receivables with 12 months overdue. They are classified as bad debt. This data are needed to determine the allowance for doubtful account and the amount of receivable that has been estimated to be paid.

This table contains the amount of trade receivable based on aging period on Sukun Cigarette Company.

Table IV.3

Trade Receivable Based On Aging Period

1999 – 2001

Time	1999	2000	2001
Current account	407.242.200	558.959.160	633.638.040
1 – 3 months overdue	261.042.480	354.846.720	345.780.360
4 – 6 months overdue	38.957.040	75.882.000	53.158.560
7 – 9 months overdue	10.053.480	17.534.520	13.577.600
10 – 12 months overdue	19.000.080	20.174.400	3.676.800
> 12 months overdue	4.707.120	4.465.440	2.912.800
Total	**741.002.400**	**1.031.862.240**	**1.052.744.160**

Source: Trade Receivable Ledger of Sukun Company's Financial For Period 1999 – 2001

4.4 Transition of Matrix Which Describes the probabilities of the debtor in fulfilling their obligation

In markov analysis, the probabilities of the debtor behavior in fulfilling their obligation and the data of aging period of receivable are needed to estimate this amount of allowance for doubtful account. The debtor behavior is formatted in the matrix transition form. The elements of matrix transition describe the probability of debtor change from one category of aging receivable period to other category in the certain period.

The debtor probability was found by computing the percentage or probabilities of certain period of receivables change to other period with observing the receivables ledger to get the information about the debtor behavior. The observation way started by checking receivable balance at the

end of one certain period on receivable ledger then move to the other period. The next step is to check whether that receivable is paid in 3 months. To find probability average, the researcher used weighted average. Table IV.4 shows the observation results

Table IV.4

Probability of Changing Period of Receivable

On Sukun Cigarette Company

For Period 1999 – 2001

Period		1999	2000	2001	Weighted Average
From	To				
Not paid	Paid	366.517.980	447.166.800	601.956.000	0,89
	1–3 Months	40.724.220	111.792.360	31.682.040	0,11
		407.242.200	**558.959.160**	**633.638.040**	
1–3 Months	Paid	208.833.960	266.135.040	293.913.000	0,8
	4–6 Months	52.208.520	88.711.680	51.867.360	0,2
		261.042.480	**354.846.720**	**345.780.360**	
4–6 Months	Paid	27.270.000	45.529.200	34.553.040	0,64
	7–9 Months	11.687.760	30.352.800	18.605.520	0,36
		38.957.760	**75.882.000**	**53.158.560**	
7–9 Months	Paid	5.529.600	12.624.840	6.109.800	0,59
	10–12 Months	4.523.880	4.909.680	7.467.600	0,41
		10.053.480	**17.534.520**	**13.577.400**	
10–12 Months	Paid	5.700.000	8.069.760	1.103.400	0,35
	>12 Months	13.300.080	12.104.640	2.573.400	0,65
		19.000.080	**20.174.400**	**3.676.800**	
>12 Months	Paid	470.400	223.200	436.680	0,09
	Uncollected	4.236.720	4.242.240	2.475.120	0,91
		4.707.120	**4.465.440**	**2.911.800**	

Based on table IV.4, it can be found the probability of certain period of receivable to other receivable period which are shown below:

- Current period

  89% paid

  11% overdue 1 – 3 months

- Overdue 1 – 3 months

  80% paid

  20% overdue 4 – 6 months

- Overdue 4 – 6 months

  64% paid

  36% overdue 7 – 9 months

- Overdue 7 – 9 months

  59% paid

  41% overdue 10 – 12 months

- Overdue 10 – 12 months

  35% paid

  65% overdue > 12 months

- Overdue > 12 months

  9% paid

  91% becomes uncollectible receivable

The matrix transition can be formed from these debtor behavior probabilities, this shown follows:

Matrix Transition of

Probability of Debtor Behavior

From/to	I	II	1	2	3	4	5	6
I	1	0	0	0	0	0	0	0
II	0	1	0	0	0	0	0	0
1	0.89	0	0	0.11	0	0	0	0
2	0.80	0	0	0	0.20	0	0	0
3	0.64	0	0	0	0	0.36	0	0
4	0.59	0	0	0	0	0	0.41	0
5	0.35	0	0	0	0	0	0	0.65
6	0.09	0.91	0	0	0	0	0	0

Where:

I = Receivables which are paid

II = Receivables which are not paid or become bad debt

1 = Current period

2 = overdue 1 – 3 months

3 = overdue 4 – 6 months

4 = overdue 7 – 9 months

5 = overdue 10 – 12 months

6 = overdue > 12 months

4.5 Computation of Markov Analysis

The following is the computation to determine the amount of allowance for doubtful account based on markov analysis.

This Thesis used software math cad 2000 to compute the data. To find the allowance for doubtful account based on markov analysis, the formula is:

$A = B \times N \times R$

Where:

$N = (1 - Q)^{-1}$

A = Matrix which shows the amount of receivable will likely to be paid a receivable that will become bad debt

B = Vector matrix which indicates the total amount of receivable based on aging period

N = Fundamental matrix

I = Identity matrix

Q, R = Square matrices which contain the whole probabilities of being in one condition to the other condition in next period.

The multiplication of matrices B, N, R will result in the matrix which has 2 columns, the first column indicates the estimation of receivable which will be paid and the second column indicates the estimation of bad debt.

1. **Matrix Transition**

From/to	I	II	1	2	3	4	5	6
I	1	0	0	0	0	0	0	0
II	0	1	0	0	0	0	0	0
1	0.89	0	0	0.11	0	0	0	0
2	0.80	0	0	0	0.20	0	0	0
3	0.64	0	0	0	0	0.36	0	0
4	0.59	0	0	0	0	0	0.41	0
5	0.35	0	0	0	0	0	0	0.65
6	0.09	0.91	0	0	0	0	0	0

From the matrix transition above it can be found the partition of matrix I, Q, R, O as shown below:

2. **Matrix Partition**

a. Identity matrix (I) with 2 x 2 ordo

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

b. Zero matrix (0) with 2 x 6 ordo

$$O = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

c. R Matrix with 6 x 2 ordo

$$R = \begin{bmatrix} 0.89 & 0 \\ 0.80 & 0 \\ 0.64 & 0 \\ 0.59 & 0 \\ 0.35 & 0 \\ 0.09 & 0.91 \end{bmatrix}$$

d. Q Matrix with 6 x 6 ordo

$$Q = \begin{bmatrix} 0 & 0.11 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.20 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0.36 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.41 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0.65 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

3. Subtraction of Matrix (I – Q)

The value of identity matrix is does not change even though the matrix rows and columns changed. Matrix 1 should be change into 6 x 6 ordo before it can be subtracted with Q matrix.

$$I - Q = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 0 & 0.11 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.20 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0.36 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.41 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0.65 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -0.11 & 0 & 0 & 0 & 0 \\ 0 & 1 & -0.20 & 0 & 0 & 0 \\ 0 & 0 & 1 & -0.36 & 0 & 0 \\ 0 & 0 & 0 & 1 & -0.41 & 0 \\ 0 & 0 & 0 & 0 & 0 & -0.65 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

4. Inverse of Matrix Partition

N matrix is found by inversing the matrix partition from the subtraction of matrix partition 1 with matrix partition Q.

$$N = (I - Q)^{-1} = \begin{bmatrix} 1 & 0.11 & 0.022 & 0.0079 & 0.0032 & 0.0021 \\ 0 & 1 & 0.20 & 0.072 & 0.0295 & 0.0192 \\ 0 & 0 & 1 & 0.36 & 0.1476 & 0.0959 \\ 0 & 0 & 0 & 1 & 0.41 & 0.2665 \\ 0 & 0 & 0 & 0 & 1 & 0.65 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

5. Multiplication of N Matrix with R Matrix

Multiplication of N matrix with R matrix will show the amount of receivable that will be paid and the estimation of allowance for doubtful account

$$\begin{bmatrix} 1 & 0.11 & 0.022 & 0.0079 & 0.0032 & 0.0021 \\ 0 & 1 & 0.20 & 0.072 & 0.0295 & 0.0192 \\ 0 & 0 & 1 & 0.36 & 0.1476 & 0.0959 \\ 0 & 0 & 0 & 1 & 0.41 & 0.2665 \\ 0 & 0 & 0 & 0 & 1 & 0.65 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} x \begin{bmatrix} 0.89 & 0 \\ 0.80 & 0 \\ 0.64 & 0 \\ 0.59 & 0 \\ 0.35 & 0 \\ 0.09 & 0.91 \end{bmatrix}$$

$$= \begin{bmatrix} 0.9981 & 0.0019 \\ 0.9825 & 0.0175 \\ 0.9127 & 0.0873 \\ 0.7575 & 0.2425 \\ 0.4085 & 0.5915 \\ 0.09 & 0.91 \end{bmatrix}$$

6. Multiplication of B Matrix with NR Matrix

Multiplication of B matrix with NR matrix will show the amount of receivable that will be paid and the estimation of allowance for doubtful account.

BNR =

$$\begin{bmatrix} 407242200 & 261042480 & 38957040 & 10053480 & 19000080 & 4707120 \\ 558959160 & 354046720 & 75882000 & 17534520 & 20174400 & 4465440 \\ 633638040 & 345780360 & 53158560 & 13557600 & 3676800 & 2912800 \end{bmatrix} \times \begin{bmatrix} 0.9981 & 0.0019 \\ 0.9825 & 0.0175 \\ 0.9127 & 0.0873 \\ 0.7575 & 0.2425 \\ 0.4085 & 0.5915 \\ 0.09 & 0.91 \end{bmatrix}$$

$$= \begin{bmatrix} 714.300.812 & 26.701.587 \\ 997.718.629 & 34.143.610 \\ 1.032.715.000 & 20.009.164 \end{bmatrix}$$

The result of the computation is shown below:

Table IV.5

Allowance for doubtful account

Based on Markov Analysis

(1999 – 2001)

Year	Trade Receivables	Allowance for doubtful account (Markov Analysis)	Percentage
1999	741.002.400	26.701.587	3.6%
2000	1.031.862.240	34.143.610	3.3%
2001	1.052.744.160	20.009.164	1.9%

4.6 Computation of Trend Analysis

Below is the computation to determine the amount of allowance for doubtful account based on trend analysis. The formula is:

$Yt = bo + b_1X$

$$b_1 = \frac{\sum XY - n\overline{XY}}{\sum X^2 - n\overline{X}^2}$$

$bo = Y - b_1 \overline{X}$

$$\overline{Y} = \frac{\sum Y}{n}$$

$$\overline{X} = \frac{\sum X}{n}$$

Where:

bo = value of Yt in year 0

b_1 = rate of growth

Table IV.6

Equation for Trend Analysis

Year	Code Year (X)	Allowance for Doubtful Account (Y)	XY	X^2
1999	0	48.165.180	0	0
2000	1	67.071.000	67.071.000	1
2001	2	68.428.320	136.856.640	4
	3	183.664.500	203.927.640	5

Where $\overline{X} = \frac{\sum X}{n} = \frac{3}{3} = 1$

$$\overline{Y} = \frac{\sum Y}{n} = \frac{183.664.500}{3} = 61.221.500$$

$$bi = \frac{\sum XY - n\overline{XY}}{\sum X^2 - n\overline{X}^2} = \frac{203.927.640 - 3(1) \times (61.221.500)}{5 - 3(1)^2}$$

$$= \frac{20.263.140}{2} = 10.131.570$$

$$bo = \overline{Y} - b.\overline{X}$$

$$= 61.221.500 - 10.131.570 . (1)$$

$$= 51.089.930$$

The equation is Yt = bo + biX

= 51.089.930 + 10.131.570X (with X = 0 at 1999)

Based on the above equation, the allowance for doubtful account based on trend analysis is:

1. In year 1999

   Yt = bo + biX

   Yt (1999) = 51.089.930 + 10.131.570 (0) = 51.089.930

2. In year 2000

   Yt (2000) = 51.089.930 + 10.131.570 (1) = 61.221.500

3. In year 2001

   Yt (2001) = 51.089.930 + 10.131.570 (2) = 71.353.070

Table IV.7
Allowance for Doubtful Account
Based on Trend Analysis
(1999 – 2001)

Year	Trade Receivables	Allowance for Doubtful Account Based on Trend Analysis	Percentage
1999	741.002.400	51.089.930	6.8%
2000	1.031.862.240	61.221.500	5.9%
2001	1.052.744.160	71.353.070	6.7%

4.7 t Test

The t test is used to determine whether there is a significant difference between allowances for doubtful account that the company has estimated and with the percentage of bad debt that actually happened. Second allowance for doubtful account based on markov analysis and with percentage of bad debt that actually happened, third is to test the allowance for doubtful account based on trend analysis and with percentage of bad debt that actually happened. This t test also aimed to choose which one between three alternatives of methods in determining the allowance for doubtful account which is the most suitable for the company. This t test used 3 year data (1999 – 2001) and level of significant (α) = 5%.

1. Testing between percentage of allowance for doubtful account in the company and percentage of bad debt that actually happened

   a. Formulation of Ho (1) & Hi (1)

      Ho (1) : There is no significant difference between the percentage of allowance for doubtful account based on company's method and the realization of percentage of trade receivables that become bad debt.

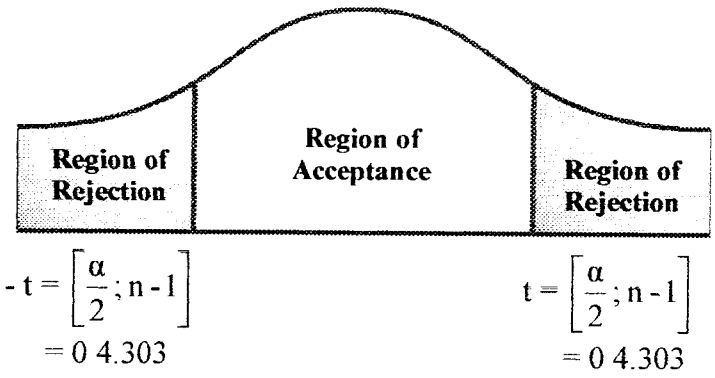
      Hi (1) : There is a significant difference between the percentage of allowance for doubtful account based on company's method and the realization of percentage of trade receivables that become bad debt.

b. Level of significant (α)

$$t = \left[\frac{\alpha}{2}; n-1\right]$$

$$t = [0.025;\ 3-1] = 4.303$$

c. t test



Ho (1) is accepted if $-4.303 \leq t \leq 4.303$

Hi (1) is rejected if $t > 4.303$ or $t < -4.303$

d. Computation of t value

Table IV.8

Percentage of Allowance for Doubtful Account Based on Company's and Percentage of Realization of Bad Debt

Year	% company 's method	% of realization	X	$X - \bar{X}$	$(X - \bar{X})^2$
1999	6.5%	3.32%	3.18	- 0.38	0.1444
2000	6.5%	3%	3.5	- 0. 06	0.0036
2001	6.5%	2.5%	4	0.44	0.1936
			10.68		0.3416

$$\bar{X} = \frac{\sum X}{n} = \frac{10.68}{3} = 3.56$$

$$SD = \sqrt{\frac{\sum (X - \bar{X})^2}{n-1}} = \sqrt{\frac{0.3416}{2}} = 0.41328$$

$$t = \frac{\bar{X}}{SD / \sqrt{n}} = \frac{3.56}{0.41328/1.732050808} = 14.919$$

e. 1Result

14.919 > 4.303, then Ho (1) is rejected

The conclusion: there is a significant difference between percentage of allowance for doubtful account based on company's with the percentage of realization of bad debt.

2. Testing between percentage of allowance for doubtful account based on markov analysis with the percentage of realization of bad debt

a. Formulation of Ho (2) & Hi (2)

Ho (2) : There is no significant difference between the percentage of allowance for doubtful account based on markov analysis with percentage realization of bad debt.

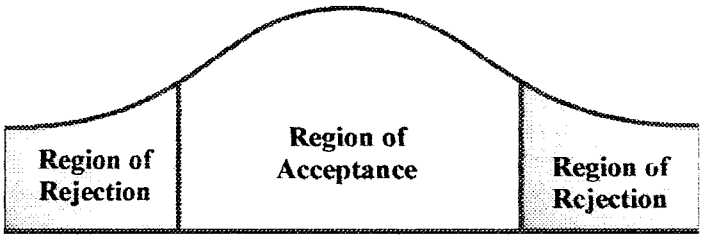
Hi (2) : There is a significant difference between the percentage of allowance for doubtful account based on markov analysis with percentage realization of bad debt.

b. Level of significant (α)

$$t = \left[\frac{\alpha}{2}; n-1\right]$$

$$t = [0.025;\ 3-1] = 4.303$$

c. t test



$$-t = \left[\frac{\alpha}{2}; n-1\right] = 0\ 4.303 \qquad t = \left[\frac{\alpha}{2}; n-1\right] = 0\ 4.303$$

Ho (2) is accepted if $-4.303 \leq t \leq 4.303$

Hi (2) is rejected if $t > 4.303$ or $t < -4.303$

d. Computation of t value

Table IV.9

Percentage of Allowance for Doubtful Account Based on Markov Analysis and Percentage of Realization of Bad Debt

Year	% Markov Analysis	% of realization	X	$X - \overline{X}$	$(X - \overline{X})^2$
1999	3.6%	3.32%	0.28	0.28667	0.08218
2000	3.3%	3%	0.3	0.30667	0.09405
2001	1.9%	2.5%	2.5	0.59333	0.35204
			- 0.02		0.52827

$$\bar{X} = \frac{\sum X}{n} = \frac{-0.02}{3} = -0.00667$$

$$SD = \sqrt{\frac{\sum (X - \bar{X})^2}{n-1}} = \sqrt{\frac{0.52827}{2}} = 0.51394$$

$$t = \frac{\bar{X}}{SD / \sqrt{n}} = \frac{-0.00667}{0.51394/1.732050808} = -0.02248$$

e. Result

$-4.303 \leq -0.02248 \leq 4.303$, then Ho (2) is accepted

The conclusion: there is no significant difference between the percentage of allowance for doubtful account based on markov analysis with the percentage of realization of bad debt.

3. Testing between percentage of allowance for doubtful account based on trend analysis with percentage of realization of bad debt

a. Formulation of Ho (3) & Hi (3)

Ho (3) : There is no significant difference between the percentage of allowance for doubtful account based on trend analysis with percentage realization of bad debt.

Hi (3) : There is a significant differece between the percentage of allowance for doubtful account based on trend analysis with percentage realization of bad debt.

b. Level of significant (α)

$$t = \left[\frac{\alpha}{2}; n-1\right]$$

$$t = [0.025;\ 3-1] = 4.303$$

c. t test

$-t = \left[\frac{\alpha}{2}; n-1\right]$ $= 0\ 4.303$

$t = \left[\frac{\alpha}{2}; n-1\right]$ $= 0\ 4.303$

Ho (3) is accepted if $-4.303 \leq t \leq 4.303$

Hi (3) is rejected if $t > 4.303$ or $t < -4.303$

d. Computation of t value

Table IV.10

Percentage of Allowance for Doubtful Account Based on Trend Analysis and Percentage of Realization of Bad Debt

Year	% Trend Analysis	% of realization	X	$X - \bar{X}$	$(X - \bar{X})^2$
1999	6.8%	3.32%	3.48	- 0.047	0.002209
2000	5.9%	3%	2.9	- 0.627	0.393129
2001	6.7%	2.5%	4.2	0.673	0.452929
			10.58		0.848267

$$\bar{X} = \frac{\sum X}{n} = \frac{10.58}{3} = 3.527$$

$$SD = \sqrt{\frac{\sum (X - \bar{X})^2}{n-1}} = \sqrt{\frac{0.848267}{2}} = 0.6512$$

$$t = \frac{\bar{X}}{SD / \sqrt{n}} = \frac{3.527}{0.6512/1.732050808} = 9.38$$

e. Result

9.38 > 4.303, then Ho (3) is rejected

The conclusion: there is a significant difference between the percentage of allowance for doubtful account based on trend analysis with the percentage of realization of bad debt.

Below is the computation result using allowance for doubtful account applied bay company, markov analysis and trend analysis. The result shows that the allowance for doubtful account based on markov analysis has the closest amount with the realization of bad debt rather than the other two methods to determine the allowance for doubtful account.

Table IV.11

Bad Debt and Allowance for Doubtful Account

Year	Bad Debt	Allowance for Doubtful Account		
		Applied on Company	Based on Markov Analysis	Based on Trend Analysis
1999	24.601.200	48.165.180	26.701.587	51.089.980
2000	30.995.200	67.071.000	34.143.610	61.221.550
2001	26.318.520	68.428.320	20.009.164	71.353.070

CHAPTER V
CONLUSION AND RECOMENDATIONS

In this last chapter, the writer is trying to give conclusions based on the research and data analysis about allowance for doubtful account from 1999 until 2001 and the recommendations, which the company of Sukun Cigarette might apply to determine the allowance for doubtful account.

5.1. Conclusions

From the result of the research and the data analysis, the following conclusions can be drawn:

1. From the estimation of allowance for doubtful account, which resulted from the trend analysis, the amount of allowance for doubtful account is shown in the table below.

Table V.1
Allowance for Doubtful Account
Based on Trend Analysis
(1999 – 2001)

Year	Trade Receivables	Allowance for Doubtful Account Based on Trend Analysis	Percentage
1999	741.002.400	51.089.930	6.8%
2000	1.031.862.240	61.221.500	5.9%
2001	1.052.744.160	71.353.070	6.7%

2. From the estimation of allowance for doubtful account, which resulted from the markov analysis, the amount of allowance for doubtful account is shown in the table below.

Table V.2

Allowance for doubtful account

Based on Markov Analysis

(1999 – 2001)

Year	Trade Receivables	Allowance for doubtful account (Markov Analysis)	Percentage
1999	741.002.400	26.701.587	3.6%
2000	1.031.862.240	34.143.610	3.3%
2001	1.052.744.160	20.009.164	1.9%

3. The allowance for doubtful account based on the markov analysis was less than the allowance for doubtful account based on fixed percentage and the amount of allowance for doubtful account based on trend analysis. This means that the estimation amount of allowance for doubtful account based on markov is the closest amount with bad debt happened in the company.

Table V.3

Bad Debt and Allowance for Doubtful Account

Year	Bad Debt	Allowance for Doubtful Account		
		Applied on Company	Based on Markov Analysis	Based on Trend Analysis
1999	24.601.200	48.165.180	26.701.587	51.089.980
2000	30.995.200	67.071.000	34.143.610	61.221.550
2001	26.318.520	68.428.320	20.009.164	71.353.070

4. The result of t test using 95% confident interval has shown that the estimation of allowance for doubtful account based on fixed percentage, which applied by company is weak. It is proven since there is a significant difference between the allowances of doubtful account based on fixed percentage and the amount of bad debt. The same thing also happens with the use of trend analysis to determine the allowance for doubtful account. But, the result of markov analysis has shown that there is no significant difference between allowances for doubtful account based on markov analysis and the amount of bad debt. So it can be concluded that markov analysis is preferable compared with the two other methods.

5.2. Suggestion

The writer has some suggestions for the company, which are:

1. The allowance for doubtful account estimation using markov analysis will give a lower amount of doubtful account allowance than the other two methods (trend analysis and fixed percentage). This will have an impact on the balance sheet in which the asset value will be higher. By using markov analysis, debtors who have a habit to overdue their debt payment can be traced. This way company can tighten their credit policy to avoid the company's loss because of sales credit will reduced and the profit will be increased. With the description above, the company may consider to change its old policy in estimating allowance for doubtful account by using the markov analysis .

2. With the consideration of the company's situation, the primary thing which the company has to do is to improve effort on debt collection, to be more selective and tightening the requirement for credit sales, in order to improve the collection of trade receivables.

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