CHAPTER 3

STUDY ON RELATIONSHIP BETWEEN GROWTH RATE OF TOTAL ASSET AND GROWTH RATE OF NET PROFITS OF THAI COMMERCIAL BANKS

SYNOPSIS

3.1 Analysis of the growth rate of total assets of Thai Commercial Banks.
3.2 Analysis of the growth rate of net profit of Thai Commercial Banks.
3.3 Analysis of the relationship between growth rate of total assets and net profits of Thai Commercial Banks.
Chapter 3

Study on relationship between growth rate of Total Assets and growth rate of net profits of Thai Commercial Banks.

From the study made in the past Chapters, it was found that Thai Commercial Banks have a very high growth rate of Total assets due to many reasons. The objectives of the research aim at making a study as to how the growth rate of the above Total assets relates with the growth rate of Net profits. Therefore, this Chapter will present study about the relationship between growth rate of Total assets and growth rate of Net profits of Thai Commercial Banks.

This study on relationship between the growth rate of Total assets and the growth rate of Net profits of Thai Commercial Banks to bring appropriate results for considering the efficiency of Thai Commercial Banks which will be discussed in the chapter to follow.

For this Chapter, before using statistical method for studying the relationship between the growth rate of Total assets and the growth rate of Net profits of Thai Commercial Banks, it will be started with analysis of the growth rate of the Total assets and the growth rate of Net profits accordingly.

Analysis of the growth rate of Total assets of Thai Commercial Banks.

The following be Table #3.1 which shows the growth rate of Total assets of 15 Thai Commercial Banks throughout 6 year period from 1987 to 1992 by calculating from the items of Total assets of 15 Thai Commercial Banks covering 6 year period as shown in Appendix A.
Table 3.1 Growth rate of Total of Thai Commercial Bank (%)

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<tbody>
<tr>
<td>Big-scale bank group</td>
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<td></td>
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<tr>
<td>2. Krueng Thai Bank</td>
<td>19.34</td>
<td>23.31</td>
<td>20.73</td>
<td>28.23</td>
<td>7.65</td>
</tr>
<tr>
<td>3. Thai Farmer Bank</td>
<td>18.66</td>
<td>28.00</td>
<td>32.95</td>
<td>15.78</td>
<td>18.00</td>
</tr>
<tr>
<td>4. The Siam Commercial Bank</td>
<td>16.97</td>
<td>33.88</td>
<td>34.21</td>
<td>22.90</td>
<td>20.59</td>
</tr>
<tr>
<td>6. The Thai Military Bank</td>
<td>25.52</td>
<td>21.83</td>
<td>22.03</td>
<td>22.01</td>
<td>21.58</td>
</tr>
<tr>
<td>Total</td>
<td>18.94</td>
<td>23.67</td>
<td>27.89</td>
<td>18.96</td>
<td>14.41</td>
</tr>
<tr>
<td>Medium-scale bank group</td>
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<tr>
<td>7. First Bangkok City Bank</td>
<td>25.06</td>
<td>16.87</td>
<td>36.40</td>
<td>28.91</td>
<td>29.61</td>
</tr>
<tr>
<td>8. The Bangkok Bank of Commerce</td>
<td>13.57</td>
<td>24.60</td>
<td>37.63</td>
<td>21.28</td>
<td>27.27</td>
</tr>
<tr>
<td>9. The Siam City Bank</td>
<td>30.41</td>
<td>20.40</td>
<td>23.54</td>
<td>21.32</td>
<td>19.34</td>
</tr>
<tr>
<td>11. The Bank of Asia</td>
<td>29.45</td>
<td>12.94</td>
<td>24.39</td>
<td>20.78</td>
<td>2.76</td>
</tr>
<tr>
<td>Total</td>
<td>22.37</td>
<td>19.43</td>
<td>29.21</td>
<td>20.35</td>
<td>21.23</td>
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<tr>
<td>Small-scale bank group</td>
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<tr>
<td>12. The Thai Danu Bank</td>
<td>33.59</td>
<td>34.40</td>
<td>39.41</td>
<td>28.11</td>
<td>21.66</td>
</tr>
<tr>
<td>13. The Union Bank of Bangkok</td>
<td>22.29</td>
<td>16.32</td>
<td>32.27</td>
<td>7.09</td>
<td>11.30</td>
</tr>
<tr>
<td>14. Nakornthon Bank</td>
<td>35.87</td>
<td>30.27</td>
<td>36.25</td>
<td>22.16</td>
<td>23.28</td>
</tr>
<tr>
<td>15. The Leam Thong Bank</td>
<td>(3.63)</td>
<td>17.88</td>
<td>23.96</td>
<td>42.27</td>
<td>38.34</td>
</tr>
<tr>
<td>Total</td>
<td>24.68</td>
<td>24.66</td>
<td>34.59</td>
<td>20.23</td>
<td>20.38</td>
</tr>
<tr>
<td>Total System of Thai Commercial Banks</td>
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<td>Source: The calculate of statistics from appendix B</td>
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Formula for calculating the growth rate of Total assets.

Growth rate 'n' year = \frac{\text{Items of 'n' year} - \text{Items of 'n-1' year}}{\text{Items of 'n-1' year}} \times 100\%

From Table #3.1 it may be summarized as follows:

From the Total system of Thai Commercial Banks, it will be seen that growth rate of Total assets for 1989 and 1990 are higher than the previous years. On the contrary, the growth rate of 1991 and 1992 were lower than the previous years, that means, at the beginning stage, the growth rate of the Total assets had a lower trend, but later it increased and again became lower. Finally, it increased again. It can be noticed that when it increased, it increased lesser than it used to be, but when it decreased, it decreased lower than it used to be. Therefore, in 1992 the growth rate of the Total assets which was 15.87% was lower than the year 1988 which was 19.77%.

For big-scale Banks group, it will be seen that the growth rates of the total assets of 1989 and 1990 were higher than the previous years. On the contrary, in 1991 and 1992 this rate was lower than the previous years for the total system of Thai commercial banks. That is, at the beginning stage, the growth rate of the total assets had a lower trend. Later, it increased and decreased again. Finally, it increased similarly. It can be noticed to the total system of Thai commercial banks that when it increased, it increased lesser than it used to be, but when it decreased, it decreased more than it used to be. Therefore, in 1992. The growth rate of the Total assets which was 14.41% became lower than in 1987, which was 18.94%.

For medium-scale Banks group, it will be seen that the growth rate of Total assets in 1990 and 1992 was higher than the previous years. On the contrary, in 1989
and 1991, this rate was lower than the previous years, that is, at the beginning stage, the growth rate of Total assets had a higher trend. Later it increased in 1990 and began to decrease. Finally, in 1992 it increased once again. It can be noticed that when it began to increase, it increased only in minimal percentage and when it decreased, it decreased more than it used to be. Therefore, in 1992 which was the period when the growth rate of Total assets has increased to 21.23%, it therefore became lower than in 1987 which was 22.37%.

Regarding small-scale Bank group. It will be seen that the growth rate of Total assets in 1990 and 1992 is higher than the previous years. On the contrary, in 1989 and 1991 this rate was lower than the previous years, that is, at the beginning stage, the growth rate of Total assets increased, then decreased. Later it increased once again in 1990 and again decreased. Finally, trend became higher in 1992. It can be noticed that when it increased, it increased lesser than it used to be and when it decreased, it decreased lesser than it used to be. Therefore, in 1992 which is the period when the growth rate of Total assets increased to 20.38%, it became lower than in 1987 which was 24.68%.

After analyzing the growth rate of Total assets in horizontal line according to time in order to observe the increase and decrease of the growth rate be letting time period in each year as variables, next analysis will be made on the growth rate of the Total assets in vertical line in order to compare between the Total system of Thai Commercial Banks and the various scales of commercial Banks group, as follows:

Comparison between the Total system of Thai Commercial Banks and big-scale Bank group, medium-scale and small-scale.

For total system of Thai Commercial Banks and big-scale Bank group-the growth rate of Commercial Bank system is higher than that big-scale Banks group in 4 year, that is,

For total system of Thai Commercial Bank and medium-scale Banks group-the growth rate of medium-scale Banks group is higher than the Total system of Commercial Banks, that is, in 1988, 1990, 1991 and 1992. As for 1989, this rate is lower than the Total system of Commercial Banks.

For total system of Thai Commercial Banks and small-scale Bank group-the growth rate of small-scale Banks group is higher than the Total system of Thai Commercial Banks every year-year by year.

Therefore, when compared between big-scale Bank group, medium-scale and small-scale, in each year it will be found that in 1988, 1989 and 1990 the growth rate of small-scale Bank group was the highest. As for the year 1991 and 1992 were concerned the growth rate for medium-scale Bank group was the highest. Second to it was small-scale Bank group and next to it was big-scale Bank group.

In short, the result of analysis of the growth rate of Total assets of Thai commercial Banks during 5 year period (1988-1992) indicated that the Total system of Thai Commercial Banks, big-scale Bank group and medium-scale Bank group has lower trend in growth rate of Total assets while the growth rate of small-scale Bank group has a higher trend. However, while analyzing the 3 sizes of Bank groups by comparing with the Total system of Commercial Banks, it was found that small-scale Bank group and medium-scale has higher growth rate than the Total system while the growth rate of big-scale Bank group had a lower trend than the Total system of Banks.
Analysis on the growth rate of Net profits of Thai Commercial Banks.

Table #3.2 shows growth rate of Net profits of 15 Thai Commercial Banks throughout 5 year period beginning from 1988 to 1992 by calculating from items of Net profits of 15 Thai Commercial Banks for 6 years (1987-1992), in Appendix A.

Formula for calculating growth rate of Net Profits

\[
\text{Growth rate of 'n' year} = \frac{\text{Items of 'n' year} - \text{Items of 'n-1' year}}{\text{Items of 'n-1' year}} \times 100\%
\]

From Table #3.2 it may be analysed that

From the Total system of Thai Commercial Bank, it will be seen that the growth rate in 1989, 1990 and 1992 of Net profits was higher than the previous years. On the contrary, in 1988 and 1991 this rate was lower than the previous years. Therefore, it may be said that the growth rate of Net profits of the Total Bank system can change in both increasing direction and in decreasing direction alternately throughout this period. But it can be observed that when it increases, it increases lesser than it used to be, but when it decreases, it decreases more than it used to be. Therefore, in 1992, the growth rate of Net profits which was 59.52% was higher than in 1988 which was 33.61%.

As regards the big scale Bank group is concerned it is seen that the growth rate in 1989, 1990 and 1992 of Net profits was higher than the previous years. On the contrary, in 1988 and 1991 this rate was lower than the previous years. The characteristics in increasing and decreasing has the similar trend as that of the Total.
system of commercial Banks. Therefore, it may be said that the growth rate of Net profits of big-scale bank group can change in both increasing direction and in decreasing direction alternately throughout this period. It can be observed that when it increases, it increases lesser than it used to be, but when it decreases, it decreases more than it used to be, similar to the whole Bank system. Therefore, in 1992 the growth rate of Net profits which was 68.34% became higher than in 1988 which was 30.09%.
### Table 3.2 Growth rate of Net Profit of Thai Commercial Banks (%)

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</tr>
<tr>
<td>1. Bangkok Bank</td>
<td>20.85</td>
<td>34.31</td>
<td>89.48</td>
<td>54.70</td>
<td>45.29</td>
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<tr>
<td>2. Krung Thai Bank</td>
<td>6.16</td>
<td>278.02</td>
<td>99.25</td>
<td>16.11</td>
<td>139.33</td>
</tr>
<tr>
<td>3. Thai Farmer Bank</td>
<td>36.18</td>
<td>47.22</td>
<td>105.97</td>
<td>9.37</td>
<td>52.82</td>
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<tr>
<td>4. The Siam Commercial Bank</td>
<td>28.74</td>
<td>50.28</td>
<td>93.99</td>
<td>24.01</td>
<td>55.88</td>
</tr>
<tr>
<td>5. Bank of Ayudthya</td>
<td>72.84</td>
<td>33.80</td>
<td>74.34</td>
<td>11.42</td>
<td>60.23</td>
</tr>
<tr>
<td>6. The Thai Military Bank</td>
<td>19.95</td>
<td>52.54</td>
<td>49.85</td>
<td>17.66</td>
<td>78.96</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>30.09</td>
<td>47.58</td>
<td>89.08</td>
<td>25.65</td>
<td>58.34</td>
</tr>
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<td><strong>Medium-scale bank group</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. First Bangkok City Bank</td>
<td>84.21</td>
<td>30.36</td>
<td>23.43</td>
<td>48.67</td>
<td>14.12</td>
</tr>
<tr>
<td>8. The Bangkok Bank of Commerce</td>
<td>25.20</td>
<td>(17.02)</td>
<td>59.69</td>
<td>43.35</td>
<td>64.05</td>
</tr>
<tr>
<td>9. The Siam City Bank.</td>
<td>(152.38)</td>
<td>120.72</td>
<td>126.36</td>
<td>24.08</td>
<td>78.56</td>
</tr>
<tr>
<td>10. Bangkok Metropolitan Bank</td>
<td>4.00</td>
<td>(30.64)</td>
<td>51.63</td>
<td>25.36</td>
<td>81.27</td>
</tr>
<tr>
<td>11. The Bank of Asia</td>
<td>470.84</td>
<td>(73.65)</td>
<td>139.03</td>
<td>(3.40)</td>
<td>89.16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>360.41</td>
<td>(5.71)</td>
<td>68.74</td>
<td>30.02</td>
<td>55.01</td>
</tr>
<tr>
<td><strong>Small-scale bank group.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. The Thai Danu Bank</td>
<td>76.03</td>
<td>18.38</td>
<td>65.42</td>
<td>18.38</td>
<td>74.17</td>
</tr>
<tr>
<td>13. The Union Bank of Bangkok</td>
<td>(32.47)</td>
<td>(1.00)</td>
<td>9.35</td>
<td>(32.59)</td>
<td>431.02</td>
</tr>
<tr>
<td>15. The Lean Thong Bank.</td>
<td>(41,098.63)</td>
<td>(104.75)</td>
<td>91.46</td>
<td>56.20</td>
<td>31.40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(182.68)</td>
<td>(271.24)</td>
<td>52.49</td>
<td>6.93</td>
<td>113.26</td>
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<tr>
<td><strong>Total System of Thai Commercial Banks.</strong></td>
<td>33.61</td>
<td>49.96</td>
<td>85.63</td>
<td>25.45</td>
<td>59.52</td>
</tr>
</tbody>
</table>

Source: The calculate of statistics from appendix B
As regards the medium-scale Bank group was concerned it is seen that the growth rate in 1988, 1990 and 1992 of Net profits was higher than the previous years. On the contrary, in 1989 and 1991 this rate was lower than the previous years. Therefore, it may be said that the growth rate of Net profits of medium-scale Bank group can change in both increasing direction and in decreasing direction alternately throughout this period. But it can be observed that when it increases, it increases higher than it used to be in certain years and when it decreases, it decreases more than it used to be which is different from the total Bank system and big-scale bank group. Therefore, in 1992, the growth rate of Net profits which was 55.01% is lower than 1988 which is 360.41%.

Small-scale Bank group-it will be seen that the growth rate in 1990 and 1992 of Net profits was higher than the previous years. On the contrary, in 1988, 1989 and 1991 this rate was lower than the previous years. Therefore, it may be said like the past that the growth rate of Net profits of small-scale Bank group can change in both increasing direction and in decreasing direction alternately throughout this period. But it can be observed that when it increases, it increases higher than it used to be in certain years and when it decreases, it decreases more than it used to be. Therefore, in 1992, the growth rate of Net profits which was 113.26% is higher than in 1988 which was -182.68%.

After analyzing and comparing the growth rate of Net profits in horizontal line according to time period, next analysis will be made on the growth rate of Net profits in vertical line similar to the analysis made on Total assets in order to compare between Thai Commercial Bank system and various scales of Commercial Bank group.

Comparison between the Total system of Thai Commercial Banks and big-scale Bank group, medium-scale and small-scale.
Total Bank system and big-scale Bank group-the growth rate of Total system is higher than big-scale Banks group for 3 years, i.e. 1988, 1989 and 1992. The rest which is 1990 and 1991 this rate is slightly lower than big-scale Bank group.

Total Bank system and small-scale Bank group-the growth rate of Total Bank system was nearly every year higher than small-scale Bank group except in 1992 when the rate of small-scale Bank group was very much higher than the Total Bank system.

Therefore, when comparing between big-scale Bank group, medium-scale and small-scale in each year, it found that within 5 years, that is, from 1988-1992 there were 3 years, that is, in 1988, 1989 and 1990 that the growth rate of big-scale Bank group was the highest. Second to the medium-scale and next was small-scale Bank group and there was only one year, that is, in 1988 that the growth rate of medium-scale Bank group became the highest. Followed respectively by big-scale Bank group and next was small-scale Bank group.

Summary result of analysis on the growth rate of Net profits of Thai Commercial Bank during 6 year period (1987-1992) revealed that the growth rate of the Net profits of the big-scale Bank group, medium-scale group and small-scale Bank group have lower and higher trends. However, while analyzing the three Bank group by comparing with the total commercial bank system it was found that in 1988 and 1991 medium-scale Bank group had higher growth rate than the Total system and was first in rank while in 1990 big-scale Bank group had higher growth rate than the Total system and finally in 1992 small-scale Bank group had higher growth rate than the Total system and also ranked first.
Analysis the relationship between growth rate of Total assets and Net profits of Thai commercial banks

In this research, the following was specified -
Growth rate of Total assets is Independent Variable. Growth rate of Net profits is Dependent Variable. This research requires 3 categories of analysis -

1. Regression Analysis

In order to create a regression analysis which shows relationship between growth rate of Total assets and Net profits of Thai commercial banks, create Linear Regression Function, as follows -

$$ Y_c = a + bx $$

$ Y_c $ = Growth rate of Net profits which is dependent variable which was calculated from the value of $ x $ already specified

= Value of the dependent variable,

$ a $ = Stable value, which is Y-Intercept, that is, it is the value of $ Y_c $ when $ x $ has the same value as $ 0 $^*

= Y-axis intercept

$ b $ = Slope of a straight line, that is, it is the value of $ Y_c $ which has changed when $ x $ changed for 1 unit

= Slope of the regression line

$ X $ = Growth rate of Total assets which is independent variable or the specified value

= the independent variable, payroll
The steps of regression analysis comprise of following steps -

1.1. Calculate the value of "a"

1.1.1 Point Estimation was obtained from:

\[ a = \bar{y} - bx \]

1.1.2 Interval Estimation was obtained from:

\[ \eta C = a \pm t_{1-\eta} \frac{\eta C (n-2)}{2} Sa \]

Wherein 2 variables are to be used:

1.1.2.1 \( S^2 a = S^2_{yx} \left[ 1 + \frac{\bar{x}^2}{\sum (x-x)^2} \right] \)

1.1.2.2 \( Syx = \frac{\sum (y-y)^2 - bx \cdot \overline{y} \cdot \bar{y}}{n - 2} \)

1.2. Finding for value of "b"

1.2.1 Point Estimation was obtained from:

\[ b = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2} \]

1.2.2 Interval Estimation was obtained from:

\[ B = b \pm t_{1-\eta} \frac{\eta C (n-2)}{2} Sb \]

Wherein 2 variables are to be used:

\[ S^2 b = \frac{S^2_{yx}}{\sum (x-x)^2} \]
1.3. Linear Regression Model from value "a" and "b" obtained from calculation:

\[ Y_c = a + bx \]

1.4. Testing the assumption that growth rate of Total assets and Net profits have no relationship, in this case, t-distribution is used in finding the value of "b" which is a Regression Coefficients by using following formula:-

\[ t = \frac{b}{s_b} \]

2. Correlation Analysis

In order to measure the level of relationship between growth rate of Total assets and net profits, one has to calculate the value of correlation Coefficients which shows the level of relationship of values x and y.

The steps in correlation analysis are:-

2.1 Calculating the value of correlation coefficients by using following formula:-

\[ r = \frac{\sum (x-x) (y-y)}{\sqrt{\sum (x-\bar{x})^2 \sum (y-\bar{y})^2}} \]

\[ r = \text{Coefficient for correlation} \]
3 - 14

x = Growth rate of total assets.

x = Average growth rate of Total assets

y = Growth rate of Net profits.

y = Average growth rate of Net profits

2.2 In testing the assumption that growth rate of Total assets and growth rate of Net profits has no relationship with one another, one has to find the value of *r* obtained as to whether or not it has any importance in statistics, in this case, statistical value of "t" is used for testing, by using the following formula:

\[ t = r \sqrt{\frac{n-2}{1 - r^2}} \]

3. Time Series Analysis

In studying the trend of growth rate of Total assets and the trend of Net profits Least Squares Linear Trend Lines is used for making an equation:

\[ Yc = a + bx \]

Yc = Growth rate of Total assets or growth rate of Net profits obtained by representing the value of *x* specified in the equation

a = Stable value is y-intercept, that is, it is the value of Yc

b = Slope of a straight line, that is, it is the value of *y* that has changed

m *x* changes for 1 unit

x = Period in "years"

3.1. Calculating the value of "a"

\[ a = \bar{y} = \frac{\sum y}{n} \]
3.2. Calculating the value of "b"

\[ b = \frac{\sum xy}{\sum x^2} \]

3.3. Linear equation from value "a" and "b" obtained from calculation:

\[ Y_c = a + bx \]

3.4. Comparison of the linear equation drawn in item 3.3 between the growth rate of Total assets and growth rate of Net profits.

Data used for research

1. Items of Total assets are used which do not include customer’s responsibility and guaranteed by 15 commercial banks for a period of 5 years (1988-1992).
2. Used Net profit after deducting income tax (not yet improved with special item) of rate commercial banks for a period of 6 years (1987-1992)

Result to be derived from analysis

As item 2 of the objectives of the analysis has mentioned that "in order to study whether or not the size of assets has an impact to capability in earning profits", therefore, analysis on this thesis will analyse on the relationship between the growth rate of Total assets and the growth rate of Net profits of Thai Commercial Banks in 4 relationships by classifying according to the size of Total assets of Thai Commercial Banks:

1. Total system of Thai Commercial Banks
2. Big-scale Bank group
3. Medium-scale Bank group
4. Small-scale Bank group

Total system of Thai Commercial Bank

Growth rate of Total assets (independent variable) and growth rate of Net profits (dependent variable) in each year used for analyzing are as follows:

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<tbody>
<tr>
<td>IV</td>
<td>19.77</td>
<td>22.96</td>
<td>28.40</td>
<td>19.35</td>
<td>15.87</td>
</tr>
<tr>
<td>DV</td>
<td>33.61</td>
<td>49.96</td>
<td>85.63</td>
<td>25.45</td>
<td>59.52</td>
</tr>
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Submission on result of research (Calculation is shown in Appendix)

1. Regression Analysis

1.1 Estimating value 'a'

1.1.1 Point estimation

\[ a = \bar{Y} - b\bar{X} \]

\[ = -14.89 \]

1.1.2 Interval estimation

\[ \alpha C = a \pm t_{1-\alpha} \frac{\alpha C}{(n-2).S_a} \]

\[ = -131.03, + 101.25 \]
That is, interval estimation of $\Delta C$ at 90% level of confidence = -131.03 to +101.25 or scope of confidence of $\Delta C$ = -131.03 and +101.25

By estimating the value of variance as follows:

1.1.2.1 Estimating the value of $'s^2_a'$:

$$s^2_a = s^2 Y.X \frac{1 + \frac{x^2}{h}}{n \sum (x-x)^2}$$

$$= 2,436.57$$

1.1.2.2 Estimating the value of $'s^2 Y.X'$:

$$s^2 Y.X = \frac{\sum (y-y)^2 - b \sum (x)(y-y)}{n - 2}$$

$$= 460.14$$

1.2 Estimating the value of 'b'

1.2.1 Estimation by using one value:

$$b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum x^2 - (\sum x)^2}$$

$$= 3.09$$

1.2.2 Interval Estimation:

$$B = b + t1- \Delta C \frac{(n-2).Sb}{2}$$
That is Interval Estimation of B at 90% level of confidence, which is, 48.45 to -2.27 or scope of confidence of B, which is, 48.45 and -2.27.

By estimating variance as follows:

1.2.2.1 Estimating the value of '\(S^2b\)'

\[
S^2b = \frac{\sum (x-\bar{x})^2}{n-2}
\]

\[
= 5.18
\]

1.2.2.2 Estimating the value of '\(S^2Y\mid X\)'

\[
S^2Y\mid X = \frac{\sum (y-\bar{y})^2 - b \sum (x-\bar{x})(y-\bar{y})}{n-2}
\]

\[
= 460.14
\]

1.3 Linear Regression from value 'a' and 'b' obtained from calculation

\[
Y_c = a + bX
\]

\[
= -14.89 \pm 3.09X
\]

1.4 Testing the assumption that growth rate of Total assets and growth rate of Net profits are not related:

1. \(H_0 : B = 0 \) (x and y has no relationship)
2. \(H_A : B \neq 0 \) (x and y has relationship)
3. \(\alpha = 10\%\)
3 - 19

\[ \pm t = \frac{b}{S_b} \]

\[ = \frac{3.09}{1.28} = 2.41 \]

4. Will refuse the assumption when

\[ t < t_{QC} (n-2) \]

is \( t \)

\[ = -2.363 \]

or \( t > t_{1- \alpha} (n-2) \)

is \( t \)

\[ = 2.353 \]

5. Therefore, will refuse assumption that \( B=0 \) which means the growth rate of Total assets and growth rate of Net profits are related.

2. Correlation Analysis

2.1 Calculating the value of ‘r’

\[ r = \frac{\sum (x-x)(y-y)}{\sqrt{\sum (x-x)^2 \sum (y-y)^2}} \]

\[ = 0.62 \]

2.2 Testing the assumption that growth rate of Total assets and growth rate of Net profits are not related:

1. \( HO : P = 0 \) (\( r \) obtained has no significance in statistics.)

\( HA : P = 0 \) (\( r \) obtained has significance in statistics.)

2. \( \alpha = 10\% \)
3. Statistics used

\[ \pm t = r \sqrt{\frac{\text{n-2}}{1 - r^2}} \]

\[ = 0.62 \sqrt{\frac{3}{1 - 0.62^2}} \]

\[ = 2.370 \]

4. Will refuse the assumption when:-

\[ t < t_{.05(3)} (n-2) \]

\[ \text{is} \ t = -2.353 \]

\[ \text{or} \ t > t_{.95(3)} (n-2) \]

\[ \text{is} \ t = 2.353 \]

5. Therefore, will refuse the assumption that \( P=0 \) which means that the growth rate of Total assets and growth rate of Net profits are related.

3. Time Series Analysis

a. Linear Trend of growth rate of Total assets:

3.1 Calculating the value of 'a'

\[ a = \frac{\sum Y}{N} \]

\[ = 21.27 \]

3.2 Calculate value of 'b'

\[ b = \frac{\sum XY}{\sum x^2} \]
3 - 21

\[ = -1.141 \]

3.3 \[ Y_c = a + bX \]

\[ = 21.27 - 1.141 x \]

Starting point begins in 1990, where \( X \) represents 1 year, \( Y \) represents growth rate of Net profit.

b. Linear trend of growth rate of Net profit

3.1 Calculate the Value of 'a'

\[ a = \frac{\sum Y}{N} \]

\[ = 50.83 \]

3.2 Calculate value of 'b'

\[ b = \frac{\sum XY}{\sum x^2} \]

\[ = 2.731 \]

3.3 \[ Y_c = a + bX \]

\[ = 50.83 + 2.731 X \]

Starting point begins in 1990, where \( X \) represents 1 year, \( Y \) represents growth rate of Net profit.
Analysis of the research obtained.

1. From analysis of regression:
   1.1 From regression analysis

   \[ Y_c = -14.89 + 3.09 \times \]

   **Meaning**

   1. In the event that \( x=0 \), that means that the Total system has no growth rate of Total assets. The value of \( Y_c \) will be equivalent to -14.89, which means, the Total Bank system will have a growth rate of Net profits = -14.89%

   2. When \( x \) has changed for one unit, that means that the growth rate of Total assets of the Total Bank system will either increase or decrease by 1%. The value of \( Y_c \) will change 3.09 times to the same direction, that means, the Total Bank system will have increased or decreased growth rate of profit by 3% to the same direction.

   1.2 By testing the assumption, by using statistics \( t \) test the value of \( B \) at significance 0.10 which means at 90% level of confidence, the result obtained was that the growth rate of Total assets and the growth rate of net profits are related.

2. From Correlation Analysis

   2.1 From value of \( r \) obtained

   \[ r = 0.62 \]
Meaning

This shows that the growth rate of assets relates with the growth rate of Net profits towards the same direction by 62%.

2.2 By testing the assumption, by using statistics 't' to test the value of P at significance 0.10 which means at 90% level of confidence, the result obtained was that 't' obtained has significance in statistics.

3. From Time Series Analysis

3.1 From trend of growth rate of Total assets

\[ Yc = 21.27 - 1.141 \times \]

(beginning point was 1990, 'x' represents 'year', 'Y' represents growth rate of assets per year)

Meaning

1. In 1990 when 'x' = '0', 'Yc' = 21.27, that means the growth rate of assets = 21.27%  

2. When 'x' changes by 1 unit from 1990, that means, there is either an increase or decrease in time by one year. 'Y' will change 1.141 times to the opposite direction, which means, the growth rate of assets will increase or decrease to the opposite direction by 1.141%.

3.2 From growth trend of Net profits

\[ Yc = 50.83 + 2.731 \times \]
(beginning point was 1990,'x' represents 'year','Y' represents growth rate of Net profits per year)

Meaning

1. In 1990 when 'x' = '0','Yc' = 50.83, that means the growth rate of Net profits = 50.83%

2. When 'x' changes by 1 unit from 1990, that means, there is either an increase or decrease in time by one year. 'Y' will change 2.731 times to the same direction, which means, the growth rate of net profit will increase or decrease to the same circuit by 2.731%.

3.3 Comparison between trend of growth rate of Total assets and trend of growth rate of Net profits from beginning point in 1990. The trend of growth rate of assets which was 21.27% has lower value than the trend of growth rate of the Net profits which was 50.83%.

Big-scale Bank group

Growth rate of Total assets (Independent variable) and growth rate of Net profits (dependent variable) in each year used for analyzing are as follows:

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent Variable</td>
<td>18.94</td>
<td>23.67</td>
<td>27.89</td>
<td>18.96</td>
<td>14.41</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td>30.09</td>
<td>47.58</td>
<td>89.08</td>
<td>25.65</td>
<td>58.34</td>
</tr>
</tbody>
</table>

Submitting result of the research (This is already show in the Appendix.)
1. Regression Analysis

1.1 Estimating the value of 'a'

1.1.1 Point Estimation

\[
a = \bar{Y} - b\bar{X}
\]

\[= -8.21\]

1.1.2 Interval Estimation

\[
\alpha C = a \pm t_{1-\alpha/2} \left(\frac{\sigma}{\sqrt{n}}\right)
\]

\[= -125.6, +109.18\]

That is, the Interval Estimation of \(\alpha C\) at level of confidence 90% = -125.6 up to +109.18 or the scope of confidence of \(\alpha C\) equals -125.6 and +109.18

By estimating the value of variance, as follows:

1.1.2.1 Estimating the value of \(S^2a\)

\[
S^2a = S^2Y.X \left(1 + \frac{\bar{X}^2}{\sum (X-\bar{X})^2}\right)
\]

\[= 2,488.61\]

1.1.2.2 Estimating the value of \(S^2Y.X\)

\[
S^2Y.X = \frac{\sum (Y-\bar{Y})^2}{n-2} - b \frac{\sum (X-\bar{X})(Y-\bar{Y})}{n-2}
\]
1.2 Estimating the value of 'b'

1.2.1 Estimation by using one value

\[ b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum x^2 - (\sum x)^2} \]

\[ = 2.81 \]

1.2.2 Interval Estimation:

\[ B = b + t_{1-\alpha} \frac{s_b}{\sqrt{n-2}} (n-2).s_b \]

\[ = 8.31, -2.7 \]

That is, the Interval Estimation of B at level of confidence 90% =8.31 up to -2.7 or the scope of confidence of B equals 8.31 and -2.7

By estimating the value of variance, as follows:

1.2.2.1 Estimating the value of \( s^2_b \)

\[ s^2_b = \frac{s^2_{Y.X}}{\sum (x-\bar{x})^2} \]

\[ = 5.50 \]

1.2.2.2 Estimating the value of \( s^2_{Y.X} \)

\[ s^2_{Y.X} = \frac{\sum (y-\bar{y})^2 - b \sum a(x-\bar{x})(y-\bar{y})}{n - 2} \]
1.3 Linear Regression from Values 'a' and 'b' obtained from calculation:-

\[ Y_c = a + bX \]

\[ = -8.21 + 2.81X \]

1.4 Testing the assumption that growth rate of Total assets and growth rate of Net profits are not related:-

1. HO : \( B = 0 \) (x and y are no related)

HA : \( B = 0 \) (x and y are related)

2. \( \alpha = 10\% \)

3. Statistics used :-

\[ \pm t = \frac{b}{S_b} \]

\[ = 2.81 \]

\[ 1.06 \]

\[ = 2.650 \]

4. Will refuse the assumption when

\[ t < t_{QC} \frac{(n-2)}{2} \]

\[ \alpha = 0.05(3) \]

\[ \text{is } t = -2.353 \]

or \( t > t_{1-\alpha} \frac{(n-2)}{2} \)

\[ \alpha = 0.95(3) \]

\[ \text{is } t = 2.353 \]
5. Therefore, will refuse assumption that B=0 which shows that growth rate of Total assets and growth rate of Net profits are related

2. Correlation Analysis :-

2.1 Calculating the value of 'r' 

\[
r = \frac{\sum (x-x')(y-y')} {\sqrt{\sum (x-x')^2 \sum (y-y')^2}}
\]

= 0.57

2.2 Testing the assumption that growth rate of Total assets and growth rate of Net profits are not related:-

1. HO : \( P = 0 \) (r obtained has no significance in statistics)
   HA : \( P = 0 \) (r obtained has significance in statistics.)

2. \( \alpha = 10\% \)

3. Statistics used

\[
\pm t = r \sqrt{\frac{n-2}{1-r^2}}
\]

= .57 \( \sqrt{\frac{3}{1-.57}} \)

= 3.206

4. Will refuse the assumption when:

\[
t < t_{\alpha/2} (n-2) \quad \text{is} \quad t_{.05(3)} = -2.353
\]
or $t > t_{1-\alpha} (n-2)$ is $t = 2.353$.

Therefore, will refuse the assumption that $P=0$ which shows that growth rate of Total assets and growth rate of net profits are related.

3. Time Series Analysis

a. Linear trend of growth rate of Total assets:

3.1 Calculating the value of 'a'

$$a = \frac{\sum Y}{N}$$

$$= 34.62$$

3.2 Calculate value of 'b'

$$b = \frac{\sum XY}{\sum x^2}$$

$$= -1.37$$

3.3 $Y_c = a + bX$

$$= 34.62 - 1.37 x$$

(Beginning point was 1990, when 'X' represents 1 year, 'Y' represents growth rate of Total assets per year.)

b. Linear trend of growth rate of Net profits:

3.1 Calculate the Value of 'a'
3.2 Calculating the value of 'b'  

\[ b = \frac{\sum XY}{\sum x^2} \]

\[ = 3.457 \]

3.3 \[ Yc = a + bX \]

\[ Yc = 83.58 + 3.457X \]

(beginning point was 1990, 'X' represents 1 year, 'Y' represents growth rate of Net profit per year.)

Analysis on result of research obtained.

1. From Regression Analysis:

1.1 From Regression

\[ Yc = -8.21 + 2.81x \]

Meaning

1. In the event that \( x = 0 \), that means big-scale Bank Group has no growth in assets, therefore, value of 'Yc' will be equivalent to -8.21, which means, the growth rate of Net profits of big-scale Bank group is equivalent to -8.21%.
2. When 'x' changed by 1 unit, that means growth rate of assets of big-scale Bank group has either increase or decrease by 1%. The value of 'Yc' will change 2.81 times to the same direction, that means, the growth rate of Net profits of big-scale Bank group will either increased or decreased in the same direction by 2.81%.

1.2 From testing assumption, by using statistics 't' to test value B at level of confidence 0.10 which means estimation at 90% the result appears that growth rate of Total assets and growth rate of net profits are related.

2. From Correlation Analysis

2.1 From value of 'r' obtained

\[ r = 0.57 \]

**Meaning**

This shows that growth rate of assets relates in the same direction as the growth rate of Net profits by 57%.

2.2 From testing assumption, by using statistics 't' to test the value of P at level of significance 0.10 which means at 90% level of confidence, the result appears that value 'r' obtained has importance in statistics.

3. From Time Series Analysis

3.1 From trend of growth rate of Total assets

\[ Y_c = 34.62 - 1.37 \times \]

(beginning point was 1990, 'x' represents 'year', 'Y' represents growth rate of assets per year)
1. In 1990 when \( x' = 0 \), \( Yc' = 34.62 \), that means growth rate of assets = 34.62%.

2. When \( x' \) changes by 1 unit from 1990, that means, there is either an increase or decrease in time by one year. \( Yc' \) will change 1.37 times to the opposite direction, which means, the growth rate of assets will increase or decrease to the opposite direction by 1.37%.

3.2 From growth trend of Net profits

\[
Yc = 83.58 + 3.457x
\]

(beginning point was 1990, \( x' \) represents 'year', \( Y' \) represents growth rate of Net profits per year)

Meaning

1. In 1990 when \( x' = 0 \), \( Yc' = 83.58 \), that means growth rate of Net profits = 83.58%.

2. When \( x' \) changes by 1 unit from 1990, that means, there is either an increase or decrease in time by one year. \( Y' \) will change 3.45 times to the same direction, which means, the growth rate of net profits will increase or decrease to the same direction by 3.45%.

3.3 Comparison between trend of growth rate of Total assets and trend of growth rate of Net profits from beginning point in 1990, the trend of growth rate of assets = 34.62% has lower value than the trend of growth rate of Net profits which was 83.58%.
Medium-scale Bank group

Growth rate of Total assets (Independent variable) and growth rate of Net profits in each year used for analysis are as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ind. Var.</td>
<td>22.37</td>
<td>19.43</td>
<td>29.21</td>
<td>20.85</td>
<td>21.23</td>
</tr>
<tr>
<td>Dep. Var.</td>
<td>360.41</td>
<td>-5.71</td>
<td>68.74</td>
<td>30.02</td>
<td>55.01</td>
</tr>
</tbody>
</table>

Result of research (Calculation is shown in the Appendix)

1. Regression Analysis

1.1 Estimating the value of 'a'

1.1.1 Point Estimation

\[
a = \bar{Y} - b\bar{X}
\]

\[= 4.65\]

1.1.2 Interval Estimation

\[
\alpha = a + t_{1-\frac{\alpha}{2}} \cdot \sigma_{\bar{X}} \cdot \sqrt{n-2}
\]

\[= -1,183.21, + 1,192.51\]

That means, Interval Estimation of at 90% Level of confidence = -1,183.21 to +1,192.51 or scope of confidence of \(\alpha\) which is -1,183.21 and +1,192.51

By estimating variance, as follows:

1.1.2.1 Estimating the value of \(S^2\alpha\)
\[ S^2_a = S^2 Y.X_1 + \frac{x^2}{n} \sum (x-x)^2 \]

1.1.2.2 Estimating the value of 'S^2 Y.X'

\[ S^2 Y.X = \frac{\sum (y-y)^2 - b \sum (x-x)(y-y)}{n-2} \]

\[ = 28,596.25 \]

1.2 Estimating the value of 'b'

1.2.1 Estimation by using one value

\[ b = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2} \]

\[ = 4.29 \]

1.2.2 Interval Estimation:

\[ B = b \pm t_{1-\alpha/2}(n-2)S_b \]

\[ = -47.64, +66.22 \]

That means, Interval Estimation of B at 90% level of confidence which is -47.64 to 66.22 or scope of confidence of B which is -47.64 and 56.22.

By estimating the value of variance, as follows:

1.2.2.1 Estimating the value of 'S^2 b'
\[ S^2_b = \frac{S^2_{YX}}{(X-\bar{X})^2} \]
\[ = 486.91 \]

1.2.2.2 Estimating the value of \( S^2_{YX} \)

\[ S^2_{YX} = \frac{\sum (Y-\bar{Y})^2 - b \sum X(X-HY)}{n-2} \]
\[ = 28,596.25 \]

1.3 Linear Regression from 'a' and 'b' which has been calculation:

\[ Yc = a + bX \]
\[ = 4.65 + 4.29X \]

1.4 Testing the assumption that growth rate of Total assets and growth rate of Net profits are not related:

1. \( H_0 : B = 0 \) (x and y are no related)
2. \( H_A : B \neq 0 \) (x and y are related)

2. \( \alpha = 10\% \)
3. Statistics used:

\[ \pm t = \frac{b}{S_b} \]
\[ = \frac{4.29}{1.72} \]
\[ = 2.494 \]
4. Will refuse the assumption when:

\[ t < t_{\alpha} (n-2) \text{ is } t = -2.353 \]

or \[ t > t_{1-\alpha} (n-2) \text{ is } t = 2.353 \]

5. Therefore, will refuse assumption that \( B = 0 \) which shows that growth rate of Total assets and growth rate of Net profits are related.

2. Correlation Analysis :-

2.1 Calculating the value of 'r'

\[ r = \frac{\sum (X-X_{\bar{}})(Y-Y_{\bar{}})}{\sqrt{\sum (X-X_{\bar{}})^2 \sum (Y-Y_{\bar{}})^2}} \]

\[ = 4.111 \]

2.2 Testing the assumption that growth rate of Total assets and growth rate of Net profits are related:

1. HO : \( P = 0 \) (r obtained has no significance in statistics)
2. HA : \( P = 0 \) (r obtained has significance in statistics.)

3. Statistics used

\[ \pm t = r \sqrt{\frac{n-2}{1-r^2}} \]
3 - 37

\[
= 0.11 \sqrt{\frac{3}{1-(.11)}}
\]

\[
= 0.111
\]

4. Will refuse the assumption when:

\[
t < t_{\alpha} \text{ (n-2)} \quad \text{is} \quad t_{\text{.05(3)}} = -2.353
\]

or \( t > t_{1-\alpha} \text{ (n-2)} \quad \text{is} \quad t_{\text{.95(3)}} = 2.353
\]

5. Therefore, will refuse the assumption that \( P = 0 \) which shows that growth rate of Total assets and growth rate of Net profits are not related.

3. Time Series Analysis

a. Trend of growth rate of Total assets:

3.1 Calculating the value of 'a'

\[
a = \frac{\sum Y}{N}
\]

\[
= 22.62
\]

3.2 Calculate the value of 'b'

\[
b = \frac{\sum XY}{\sum x^2}
\]

\[
= -0.086
\]
3.3 \( Y_c = a + bX \)

\[ = 22.62 - 0.086x \]

(Beginning point was 1990, 'X' represents 1 year, 'Y' represents growth rate of Total assets per year.)

b. Trend of growth rate of Net profits -

3.1 Calculate the Value of 'a'

\[ a = \frac{\sum Y}{N} \]

\[ = 101.69 \]

3.2 Calculating the value of 'b'

\[ b = \frac{\sum XY}{\sum x^2} \]

\[ = -57.51 \]

3.3 \( Y_c = a + bX \)

\[ = 101.69 - 57.51X \]

(beginning point was 1990, 'X' represents 1 year, 'Y' represents growth rate of Net profit per year.)
Analysis result of research obtained.

1. From Regression Analysis:

1.1 From Regression

\[ Y_c = 4.65 + 4.29x \]

**Meaning**

1. In the event that \( x = 0 \), that means medium-scale Bank Group has no growth in Total assets whatsoever therefore, the value of \( Y_c \) will be equivalent to 4.65, which means, that medium-scale Bank group will have a growth rate of Net profits = 4.65%.

2. When \( x \) changed by 1 unit, that means growth rate of assets of medium-scale Bank group has either increase or decrease by 1%. The value of \( Y_c \) will change 4.29 times to the same direction, that means, the growth rate of Net profits of medium-scale Bank group will either increase or decrease in the same direction by 4.29%.

1.2 By testing assumption, by using statistics \( t \) to test the value of \( B \) at level of significance 0.10 which means at 90% level of confidence, the result obtained was that growth rate of Total assets and growth rate of net profits are not related.

2. From Correlation Analysis

2.1 From value of \( r \) obtained

\[ r = 0.11 \]
Meaning

This shows that the growth rate of assets relates is related in the same direction with the growth rate of the Net profits by 11%.

2.2 By testing assumption, by using statistics 't' to test the value of P at level of significance 0.10 which means at 90% level of confidence, the result appeared that value 'r' obtained has no significance in statistics.

3. From Time Series Analysis

3.1 From trend of growth rate of Total assets

\[ Y_c = 22.62 - 0.086x \]

(beginning point was 1990, 'x' represents 'year', 'Y' represents growth rate of assets per year)

Meaning

1. In 1990 when 'x' = 0', 'Yc' will be equivalent to 22.62, that means the growth rate = 22.62%.

2. When 'x' changes by 1 unit from 1990, that means, there is either an increase or decrease in time by one year. 'Y' will change 0.09 times to the opposite direction, which means, the growth rate of assets will increase or decrease to the opposite direction by 0.09%.

3.2 From growth trend of Net profits

\[ Y_c = 101.69 - 57.51x \]

(beginning point was 1990, 'x' represents 'year', 'Y' represents growth rate of Net profits per year)
Meaning

1. In 1990 when ‘x’ = ‘0’, ‘Yc’ will be equivalent to 101.69 that means growth rate of Net profits = 101.69%.

2. When ‘x’ changes by 1 unit from 1990, that means, there is either an increase or decrease in time by one year. ‘Y’ will change 57.51 times to the opposite direction, which means, the growth rate of net profits will increase or decrease to the opposite direction by 57.51%.

3.3 Comparison between trend equation of growth rate of Total assets and trend equation of growth rate of Net profits from beginning point in 1990. The trend of growth rate of assets which was 22.62% has lower value than the trend of growth rate of Net profits which was 101.69%.

Small-scale Bank group

Growth rate of Total assets (Independent variable) and growth rate of Net profits (dependent Variable) in each year used for analysis are as follows:-

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variable</td>
<td>24.68</td>
<td>24.66</td>
<td>34.59</td>
<td>20.29</td>
<td>20.38</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td>-182.68</td>
<td>-271.24</td>
<td>52.49</td>
<td>6.93</td>
<td>113.26</td>
</tr>
</tbody>
</table>

Result of research (Calculation is shown in the Appendix)

1. From Regression Analysis

1.1 Estimating value of ‘a’

1.1.1 Point Estimation

\[
a = \bar{Y} - b\bar{X} = -70.21
\]
1.1.2 Interval Estimation

\[ a + t_{1-\alpha/2} \frac{S_a}{\sqrt{n-2}} \]

\[ = -1,039.43, + 899.01 \]

That is Interval Estimation of \( a \) at 90% level of confidence = -1,039.43 to 899.01 or scope of confidence of \( a \) is -1,039.43 and 899.01

By estimating variance, as follows:

1.1.2.1 Estimating the value of '\( S^2_a \)'

\[ S^2_a = S^2 Y.X \frac{1 + \frac{x^2}{\sum (x-x)^2}}{n} \]

\[ = 169,673.05 \]

1.1.2.2 Estimating the value of '\( S^2 Y.X \)'

\[ S^2 Y.X = \frac{\sum (Y-Y)^2 - b \sum x(x)(Y-Y)}{n-2} \]

\[ = 35,570.87 \]

1.2 Estimating the value of 'b'

1.2.1 Estimation by using one value

\[ b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum x^2 - (\sum x)^2} \]

\[ = 0.56 \]
1.2.2 Interval Estimation:

\[ B = b + t_{1-\alpha} (n-2)S_b \]

\[ = -37.53, +38.65 \]

That is Interval Estimation of B at 90% level of confidence = -37.53 to 38.65 or scope of confidence of B = -37.53 and 38.65.

By estimating variance, as follows:

1.2.2.1 Estimating the value of \( S^2_b \)

\[ S^2_b = \frac{S^2_{YX}}{\sum (x-x)^2} \]

\[ = 262.17 \]

1.2.2.2 Estimating the value of \( S^2_{YX} \)

\[ S^2_{YX} = \frac{\sum (Y \bar{Y})^2 - b \sum (x-x) (Y \bar{Y})}{n-2} \]

\[ = 35,570.87 \]

1.3 Linear Regression Function from value 'a' and 'b' obtained from calculation:

\[ Y_c = a + bX \]

\[ = -70.21 + 0.56 X \]
1.4 Testing the assumption that growth rate of Total assets and growth rate of Net profits are not related:

1. **HO** : \( B = 0 \) (x and y are no related)
   
   **HA** : \( B = 0 \) (x and y are related)

2. \( \alpha \) = 10%

3. Statistics used :

   \[ \pm_t = \frac{b}{s_b} \]

   \[ = \frac{0.56}{16.19} = 0.035 \]

4. Will refuse the assumption when:

   \[ t < t_{\alpha} (n-2) \]
   
   \[ t_{0.05(3)} = -2.353 \]

   or \[ t > t_{1-\alpha} (n-2) \]
   
   \[ t_{0.95(3)} = 2.353 \]

5. Therefore, will refuse assumption that \( B = 0 \) which shows that growth rate of Total and growth rate of Net profits are not related.

2. **Correlation Analysis**:

   2.1 Calculating the value of 'r'
2.2 Testing the assumption that growth rate of Total assets and growth rate of Net profits are not related:–

1. \( H_0 : \rho = 0 \) (\( \rho \) obtained has no significance in statistics)
   \( H_A : \rho = 0 \) (\( \rho \) obtained has significance in statistics.)

2. \( \alpha = 10\% \)

3. Statistics used

   \[ + t = \frac{r}{\sqrt{1 - r^2}} \sqrt{\frac{n-2}{1 - r^2}} \]

   \[ = 0.019 \sqrt{\frac{3}{1 - (0.019)}} \]

   \[ = 0.0329 \]

4. Will refuse the assumption when:

   \[ t < t_{\alpha/2} (n-2) \]

   \[ = -2.353 \]

   or \[ t > t_{1-\alpha/2} (n-2) \]

   \[ = 2.353 \]

5. Therefore, will accept the assumption that \( \rho = 0 \) which shows that growth rate of Total assets and growth rate of Net profits are not related.
3. Time Series Analysis

a. Trend of growth rate of Total assets:-

3.1 Calculating the value of 'a'

\[ a = \frac{\sum Y}{N} \]

\[ = 24.92 \]

3.2 Calculate the value of 'b'

\[ b = \frac{\sum XY}{\sum x^2} \]

\[ = -1.297 \]

3.3 \( Y_c = a + bX \)

\[ = 24.92 - 1.297 x \]

(Beginning point was 1990, 'X' represents 1 year, 'Y' represents growth rate of Total assets per per year.)

b. Trend of growth rate of Net profits :-

3.1 Calculate the Value of 'a'

\[ a = \frac{\sum Y}{N} \]

\[ = -56.25 \]
3.2 Calculating the value of 'b'

\[
b = \frac{\sum XY}{\sum x^2} = 87.00
\]

3.3 \( Yc = a + bX \)

\[
= -56.25 + 87.00X
\]

(beginning point was 1990, 'X' represents 1 year, 'Y' represents growth rate of Net profit per year.)

Analysis result of research obtained.

1. From Regression Analysis:
   1.1 From Regression

\[
Yc = -70.21 + 0.56x
\]

**Meaning**

1. In the event that \( x = 0 \), that means small-scale Bank Group has no growth in assets therefore, of 'Yc' will be equivalent to -70.21, which means, the growth rate of Net profits of small-scale Bank group will be equivalent to -70.21%.

2. When 'x' changed by one unit, that means there is either an increase or decrease in assets by 1%. for small-scale Bank group. Value of 'Yc' will change 0.56 times to the same direction, which means, the growth rate of Net profits of small-scale Bank group will increase or decrease to the same direction by 0.56%.
1.2 By testing assumption, by using statistics ‘t’ to test the value of B at level of significance 0.10 which means at 90% level of confidence, the result appeared that the growth rate of Total assets and the growth rate of net profits are related.

2. From Correlation Analysis
   2.1 From value of ‘r’ obtained

\[ r = 0.019 \]

**Meaning**

This shows that the growth rate of assets relates is related to the growth rate of Net profits in the same direction by 1.90%

2.2 By testing assumption, by using statistics ‘t’ to test the value of P at level of significance 0.10 which means at 90% level of confidence, the result appears that value of ‘r’ obtained has significance in statistics.

3. From Time Series Analysis
   3.1 From trend of growth rate of Total assets

\[ Yc = 24.92 - 1.297x \]

(beginning point was 1990 ‘x’ represents ‘year’, ‘Y’ represents growth rate of assets per year)
3 - 49

Meaning

1. In 1990 when \( x = 0 \), \( Y_c = 24.92 \), that means growth rate of assets = 24.92%.

2. When \( x \) changes by 1 unit from 1990, that means, there is either an increase or decrease in time by one year. \( Y \) will change -1.297 times to the opposite direction, which means, the growth rate of assets will increase or decrease to the opposite direction by 1.297%.

3.2 From trend of growth rate of Net profits

\[ Y_c = -56.25 + 87.00 \times \]

(beginning point was 1990, \( x \) represents 'year', \( Y \) represents growth rate of Net profits per year)

Meaning

1. In 1990 when \( x = 0 \), \( Y_c \) is equivalent to -56.25 that means growth rate of Net profits = -56.25.

2. When \( x \) changes by 1 unit from 1990, that means, there is either an increase or decrease in time by one year. \( Y \) will change 87 times to the same direction, which means, the growth rate of net profits will increase or decrease to the same direction by 87.0%.

3.3 Comparison between trend equation of growth rate of Total assets and trend equation of growth rate of Net profits from beginning point in 1990. The trend of growth rate of assets which was 24.92% has higher value than the trend of growth rate of Net profits which was -56.25%.
Conclusion on testing assumption

From regression analysis and testing value 'B' as well as correlation analysis and testing value 'P' by using statistics 't' at significance 0.1 which means 90% level of confidence, the result appeared coincides with the following:

1. Growth rate of Total assets and growth rate of Net profits of Total system of Thai commercial Banks are related in the same direction.
2. Growth rate of Total assets and growth rate of Net profits of big-scale Bank group are related in the same direction.
3. Growth rate of Total assets and growth rate of Net profits of medium-scale Bank group are related in the same direction.
4. Growth rate of Total assets and growth rate of Net profits of small-scale Bank group are not related.

Therefore, this Chapter will verify two assumptions in making research (mentioned in Chapter 1) that:

1. Growth rate of Total assets is related with growth rate of Net profits in the same direction.
2. Relationships of growth rate of Total assets and growth rate of Net profits are different depending size (or scale) of Commercial Banks.

By accepting both items of the assumption.

Reason for accepting item 1 of the assumption:

Due to the fact that the growth rate of Total assets and the growth rate of Net profits of the total system of Thai Commercial Banks do relate in the same
direction by having regression coefficients = 3.09 and coefficient of correlation = 0.62

Reason for accepting item 2 of the assumption:

Due to the fact that the growth rate of Total assets and the growth rate of Net profits of various sizes (or scales) of Bank group under Thai Commercial Bank system are different, therefore, they are as follows:

1. Big-scale Bank group - has relationship in the same direction by having regression coefficients = 2.81 and coefficient of correlation = 0.57.

2. Medium-scale Bank group - has relationship in the same direction by having regression coefficients = 4.29 and coefficient of correlation = 0.11.

3. Small-scale Bank group - has no relationship by having regression coefficients = 0.66 and coefficient of correlation = 0.019.

That means, the growth rate of Total assets and the growth rate of Net profits of big-scale Bank group do relate at the highest in the same direction. Second to it was medium-scale Bank group while the said relationship of the small-scale Bank group is the lowest.

Therefore, the research is capable of verifying the assumption, that is, accepting the 2 assumptions that they are true during research period from 1988-1992.

The reason why the growth rate of Total assets and the growth rate of Net profits of small-scale Bank group are not related is due to the following reasons:

1. The reason being the extension of Bank branches - Due to the good points (and the advantage in the increase of branches for giving service to customers) including the attitude towards the size (or scale) of Bank and number of Branches, this enables an extension of small-scale Banks in a numerous and rapid
ways. It also results in the growth rate of assets for small-scale Banks. Apparently, the growth rate of Net profits did not increase due to:

1.1 High capital investment and expenses. To extend by increasing Branches, assets will have to be invested which causes high expenses, i.e. regular assets, etc.

1.2 Low income. Since investment in a new Branch can be compared to a new project, therefore, remuneration at the beginning stage, which covers short period, will be very low.

When the expenses are high while the income is low, this results in low profit, which means, growth rate of Net profits did not increase, as some of the increased assets, are the assets which cause expenses.

2. The reason being the capital investment. Certain small-scale Banks have problem in shortage of capital which is an obstacle for releasing loans which could earn income at high rate, that it is compelled to utilize part of the deposits for investment is assets which will earn rather low income, such as, investing in stock exchange.

The said irrelevancy - causes or obstacles of some Banks may be due to item 1 above. Obstacles of certain Banks may be due to item 2 while obstacles of the rest of the Banks may be due to both items.

Conclusion. The reason why growth rate of Total assets and growth rate of Net profits of small-scale Bank group are not related is due to the extension and shortage of capital wherein the above reason has sent an impact to the increase in assets which are the assets that creates expenses or assets which earn low income. This finally enables low income and profit.
However, ever though the causes for extension of item 2 will earn low profit in short-term, but in the long run it will bring high income and profit as well as many aspects of benefit which ought to be pursued.

As regards shortage of capital in item 2, this ought to be remedied so as not to lose an opportunity in increasing income which will send good result in operating banking business.
Appendix B

The Calculator of Statistics

(For Chapter 3)
The total system of Thai Commercial Bank

Regression Analysis

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X²</th>
<th>Y²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>19.77</td>
<td>33.61</td>
<td>664.47</td>
<td>390.85</td>
<td>1,129.63</td>
</tr>
<tr>
<td>1989</td>
<td>22.96</td>
<td>49.96</td>
<td>1,147.08</td>
<td>527.16</td>
<td>2,496.00</td>
</tr>
<tr>
<td>1990</td>
<td>28.40</td>
<td>85.63</td>
<td>2,431.89</td>
<td>806.56</td>
<td>7,332.50</td>
</tr>
<tr>
<td>1991</td>
<td>19.35</td>
<td>25.45</td>
<td>492.46</td>
<td>374.42</td>
<td>647.70</td>
</tr>
<tr>
<td>1992</td>
<td>15.87</td>
<td>59.52</td>
<td>944.58</td>
<td>251.86</td>
<td>3,542.63</td>
</tr>
<tr>
<td></td>
<td>106.35</td>
<td>254.17</td>
<td>5,680.48</td>
<td>2,350.85</td>
<td>15,148.46</td>
</tr>
</tbody>
</table>

\[\bar{X} = 21.27\]
\[\bar{Y} = 50.83\]

\[b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}\]
\[= \frac{5(5,680.48) - (106.35)(254.17)}{5(2,350.85) - (106.35)^2}\]
\[= 3.09\]
\[a = \bar{Y} - b\bar{X}\]
\[= 50.83 - 3.09(21.27)\]
\[= -14.89\]
Correlation of Analysis.

<table>
<thead>
<tr>
<th>Year</th>
<th>$X$</th>
<th>$Y$</th>
<th>$(X-ar{X})$</th>
<th>$(Y-ar{Y})$</th>
<th>$(X-ar{X})(Y-ar{Y})$</th>
<th>$(X-ar{X})^2$</th>
<th>$(Y-ar{Y})^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>19.77</td>
<td>33.61</td>
<td>(1.50)</td>
<td>(17.22)</td>
<td>25.84</td>
<td>2.25</td>
<td>296.67</td>
</tr>
<tr>
<td>1989</td>
<td>22.96</td>
<td>49.96</td>
<td>1.69</td>
<td>(0.87)</td>
<td>(1.48)</td>
<td>2.86</td>
<td>0.76</td>
</tr>
<tr>
<td>1990</td>
<td>28.40</td>
<td>85.63</td>
<td>7.13</td>
<td>34.80</td>
<td>248.10</td>
<td>50.84</td>
<td>1,210.76</td>
</tr>
<tr>
<td>1991</td>
<td>19.35</td>
<td>25.45</td>
<td>(1.92)</td>
<td>(25.38)</td>
<td>48.74</td>
<td>3.69</td>
<td>644.35</td>
</tr>
<tr>
<td>1992</td>
<td>15.87</td>
<td>59.52</td>
<td>(5.40)</td>
<td>8.69</td>
<td>(46.90)</td>
<td>29.16</td>
<td>75.45</td>
</tr>
<tr>
<td></td>
<td>106.35</td>
<td>254.17</td>
<td>0.00</td>
<td>0.02</td>
<td>274.29</td>
<td>88.79</td>
<td>2,227.99</td>
</tr>
</tbody>
</table>

\[
\bar{X} = 21.27
\]

\[
\bar{Y} = 50.83
\]

\[
r = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2 \sum (Y - \bar{Y})^2}}
\]

\[
= \frac{274.29}{\sqrt{(88.79)(2,227.99)}}
\]

\[
= 0.62
\]
Estimating the value of variance.

\[
S^2_{y.x} = \frac{\sum (Y - \bar{Y})^2 - b \sum (X - \bar{X})(Y - \bar{Y})}{n-2}
\]

\[
= \frac{2,227.90 - 3.09 (274.29)}{3}
\]

\[
= 460.14
\]

\[
S^2_a = S^2_{y.x} \left[ \frac{1 + \frac{\bar{X}^2}{N}}{\sum (X - \bar{X})^2} \right]
\]

\[
= 460.14 \left[ \frac{1 + (21.27)^2}{588.79} \right]
\]

\[
= 2,463.57
\]

\[
S^2_b = \frac{S^2_{y.x}}{\sum (X - \bar{X})^2}
\]

\[
= \frac{460.14}{88.79}
\]

\[
= 5.18
\]
Interval estimation of \( \alpha \) at 90% level of confidence.

\[
\begin{align*}
\hat{a} + t_{1-\frac{\alpha}{2}, (n-2)} \cdot \frac{\sigma}{\sqrt{n}} &= -14.89 \pm t_{0.95(5-2)} \sqrt{\frac{2,436.57}{2}} \\
&= -14.89 \pm (2.353) (4.93) \\
&= -14.89 \pm 116.14 \\
&= 131.03, +101.25
\end{align*}
\]

Interval estimation of \( B \) at 90% level of confidence.

\[
\begin{align*}
\hat{b} + t_{1-\frac{\alpha}{2}, (n-2)} \cdot \frac{\sigma}{\sqrt{n}} &= 3.09 \pm t_{0.95(5-2)} \sqrt{\frac{5.18}{2}} \\
&= 3.09 \pm (2.353)(2.28) \\
&= 3.09 \pm 5.36 \\
&= 8.45, -2.27
\end{align*}
\]
Time Series Analysis

The trend of growth rate of assets.

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>$X^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>-2.00</td>
<td>19.77</td>
<td>(39.54)</td>
<td>4.00</td>
</tr>
<tr>
<td>1989</td>
<td>1.00</td>
<td>22.96</td>
<td>(22.96)</td>
<td>1.00</td>
</tr>
<tr>
<td>1990</td>
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</tr>
<tr>
<td>1991</td>
<td>1.00</td>
<td>19.35</td>
<td>19.35</td>
<td>1.00</td>
</tr>
<tr>
<td>1992</td>
<td>2.00</td>
<td>15.87</td>
<td>31.74</td>
<td>4.00</td>
</tr>
</tbody>
</table>

\[
a = \bar{Y} = \frac{\sum Y}{n} = 106.35 \quad 5.00
\]

\[
b = \frac{\sum XY}{\sum X^2} = \frac{-11.41}{10} = -1.141
\]

\[
Y_c = a + bX
\]

\[
= 21.27 - 1.141X
\]
The Trend of growth rate of net profit

\[
a = \overline{\text{Y}} = \frac{\sum Y}{n} = \frac{254.17}{5} = 50.83
\]

\[
b = \frac{\sum XY}{\sum X^2} - a = \frac{27.31}{10} = 2.731
\]

\[
Y_c = a + bX = 50.83 + 2.731X
\]

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>2.00</td>
<td>33.61</td>
<td>67.22</td>
<td>4.00</td>
</tr>
<tr>
<td>1989</td>
<td>1.00</td>
<td>49.96</td>
<td>49.96</td>
<td>1.00</td>
</tr>
<tr>
<td>1990</td>
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<td>1992</td>
<td>2.00</td>
<td>59.52</td>
<td>119.04</td>
<td>4.00</td>
</tr>
<tr>
<td>Year</td>
<td>0.00</td>
<td>254.17</td>
<td>27.31</td>
<td>10.00</td>
</tr>
</tbody>
</table>
## Analysis of Regression

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X²</th>
<th>Y²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>18.94</td>
<td>30.09</td>
<td>569.90</td>
<td>358.72</td>
<td>950.41</td>
</tr>
<tr>
<td>1989</td>
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<td>47.58</td>
<td>1,126.22</td>
<td>560.27</td>
<td>2,263.86</td>
</tr>
<tr>
<td>1990</td>
<td>27.89</td>
<td>89.08</td>
<td>2,484.44</td>
<td>777.85</td>
<td>7,935.25</td>
</tr>
<tr>
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<td>25.65</td>
<td>486.32</td>
<td>359.48</td>
<td>657.92</td>
</tr>
<tr>
<td>1992</td>
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<td>58.34</td>
<td>840.68</td>
<td>207.65</td>
<td>3,403.56</td>
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<tr>
<td></td>
<td>103.87</td>
<td>250.74</td>
<td>5,507.57</td>
<td>2,263.97</td>
<td>15,165.99</td>
</tr>
</tbody>
</table>

\[
\bar{X} = 20.77 \\
\bar{Y} = 50.15 \\
b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2} = \frac{5(5,507.57) - (103.87)(250.74)}{5(2,263.97) - (103.87)^2} = 2.81 \\
a = \bar{Y} - b\bar{X} = 50.15 - 2.81(20.77) = -8.21
Correlation Analysis

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>(X-X)</th>
<th>(Y-Y)</th>
<th>(X-X)(Y-Y)</th>
<th>(X-X)^2</th>
<th>(Y-Y)^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>18.94</td>
<td>30.09</td>
<td>1.83</td>
<td>20.06</td>
<td>36.79</td>
<td>3.36</td>
<td>402.32</td>
</tr>
<tr>
<td>1989</td>
<td>23.67</td>
<td>47.58</td>
<td>2.90</td>
<td>2.57</td>
<td>7.44</td>
<td>8.39</td>
<td>6.59</td>
</tr>
<tr>
<td>1990</td>
<td>27.89</td>
<td>89.08</td>
<td>7.12</td>
<td>38.93</td>
<td>277.04</td>
<td>50.64</td>
<td>1,515.70</td>
</tr>
<tr>
<td>1991</td>
<td>18.96</td>
<td>25.65</td>
<td>1.81</td>
<td>24.50</td>
<td>44.44</td>
<td>3.29</td>
<td>600.15</td>
</tr>
<tr>
<td>1992</td>
<td>14.41</td>
<td>58.34</td>
<td>6.36</td>
<td>8.19</td>
<td>52.13</td>
<td>40.50</td>
<td>67.11</td>
</tr>
<tr>
<td></td>
<td>103.87</td>
<td>250.74</td>
<td>0.00</td>
<td>0.00</td>
<td>298.70</td>
<td>106.18</td>
<td>2,591.88</td>
</tr>
</tbody>
</table>

\[ \bar{X} = 20.77 \]
\[ \bar{Y} = 50.15 \]

\[ r = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2 \sum (Y - \bar{Y})^2}} \]

\[ r = \frac{298.70}{\sqrt{(106.18) (2,591.88)}} \]

\[ r = 0.57 \]
Estimating the value of variance

\[ S^2_{y.x} = \frac{\sum (Y - \bar{Y})^2 - b \sum (X - \bar{X})(Y - \bar{Y})}{n-2} \]

\[ = \frac{2.591.88 - 2.81 \times 298.80}{3} \]

\[ = 584.18 \]

\[ S^2_a = S^2_{y.x} \left[ 1 + \frac{\bar{x}^2}{N \sum (X - \bar{X})^2} \right] \]

\[ = 584.18 \left[ 1 + \frac{(20.77)^2}{5 \times 106.18} \right] \]

\[ = 2488.61 \]

\[ S^2_b = \frac{S^2_{y.x}}{\sum (X - \bar{X})^2} \]

\[ = 584.18 \]

\[ = 5.50 \]
Interval estimation of $a$ at 90% level of confidence

$$a \pm t \frac{S_a}{\sqrt{1-\frac{\alpha}{2}(n-2)}} = -8.21 \pm t \frac{\sqrt{2436.57}}{2(0.95)(3)}$$

$$= -8.21 \pm (2.353)(49.89)$$

$$= -8.21 \pm 117.39$$

$$= -125.6, +109.18$$

Interval estimation of $b$ at 90% level of confidence

$$b \pm t \frac{S_b}{\sqrt{1-\frac{\alpha}{2}(n-2)}} = 2.81 \pm t \frac{\sqrt{5.18}}{2(0.95)(3)}$$

$$= 2.81 \pm (2.353)(2.34)$$

$$= 2.81 \pm 5.50$$

$$= 8.31, -2.7$$
Time Series Analysis

The Trend of growth rate of assets.

\[
\begin{array}{c|cccc}
\text{Year} & X & Y & XY & X^2 \\
\hline
1988 & 2.00 & 18.94 & 37.88 & 4.00 \\
1989 & 1.00 & 23.67 & 23.67 & 1.00 \\
1990 & 0.00 & 27.89 & 0.00 & 0.00 \\
1991 & 1.00 & 18.96 & 18.96 & 1.00 \\
1992 & 2.00 & 14.41 & 28.82 & 4.00 \\
\hline
\end{array}
\]

\[
a = \bar{Y} = \frac{\sum Y}{n} = \frac{103.87}{3.00} = 34.62
\]

\[
b = \frac{\sum XY}{\sum X^2} = \frac{-13.77}{10} = -1.377
\]

\[
Y_c = a + bX
\]

\[
= 34.62 - 1.37X
\]
The trend of growth rate of net profit

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>2.00</td>
<td>30.09</td>
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<td>1990</td>
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<td>89.08</td>
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<tr>
<td>1992</td>
<td>2.00</td>
<td>58.34</td>
<td>116.68</td>
<td>4.00</td>
</tr>
</tbody>
</table>

\[
a = \bar{Y} = \frac{\sum Y}{n} = \frac{250.74}{5} = 50.14
\]

\[
b = \frac{\sum XY}{\sum X^2} = \frac{34.57}{10} = 3.457
\]

\[Yc = a + bX = 83.58 + 3.457X\]
Medium-scale bank group

Regression Analysis

<table>
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<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
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<th>Y²</th>
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<td>1991</td>
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<tr>
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<td>113.09</td>
<td>508.47</td>
<td>11,753.10</td>
<td>2,616.60</td>
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</table>

\[ \bar{X} = 22.62 \]

\[ \bar{Y} = 101.69 \]

\[ b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2} \]

\[ = \frac{5(11,753.10) - (113.09)(508.47)}{5(2,616.60) - (113.09)^2} \]

\[ = 4.29 \]

\[ a = \bar{Y} - b\bar{X} \]

\[ = 101.69 - 97.04 \]

\[ = 4.65 \]
## Correlation of Analysis

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<td>1988</td>
<td>22.37</td>
<td>360.41</td>
<td>0.25</td>
<td>258.72</td>
<td>(64.16)</td>
<td>0.06</td>
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<tr>
<td>1989</td>
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<td>(5.71)</td>
<td>3.19</td>
<td>(107.40)</td>
<td>342.40</td>
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<td>3.13</td>
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<td>(1.36)</td>
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<td>86,872.11</td>
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\[
\overline{X} = 22.62 \\
\overline{Y} = 101.69 \\
\]

\[
r = \frac{\sum (X - \overline{X})(Y - \overline{Y})}{\sqrt{\sum (X - \overline{X})^2 \sum (Y - \overline{Y})^2}} \\
= \frac{252.53}{\sqrt{(58.73)(86,872.11)}} \\
= 0.11
\]
Estimating the value of variance

\[ S^2_{y.x} = \frac{\sum (Y - \bar{Y})^2 - b \sum (X - \bar{X})(Y - \bar{Y})}{n-2} \]

\[ = \frac{(86,872.11) - (4.29)(252.53)}{3} \]

\[ = 28,596.25 \]

\[ S^2_a = S^2_{y.x} \left[ \frac{1 + \frac{\bar{X}^2}{\sum (X - \bar{X})^2}}{N} \right] \]

\[ = 28,596.25 \left[ \frac{1 + \frac{(22.62)^2}{58.73}}{5} \right] \]

\[ = 254,855.74 \]

\[ S^2_b = \frac{S^2_{y.x}}{\sum (X - \bar{X})^2} \]

\[ = \frac{28,596.25}{58.73} \]

\[ = 486.91 \]
Interval of estimation of $a$ at 90% level of confidence

\[
\begin{align*}
    a \pm t \frac{S_a}{\sqrt{n-2}} &= 4.65 \pm t \frac{\sqrt{254,855.74}}{.95(3)} \\
    &= 4.65 \pm (2.353)(504.83) \\
    &= 4.65 \pm 1,187.86 \\
    &= [1,195.51, -1,183.21]
\end{align*}
\]

Interval estimation of $b$ at 90% level of confidence

\[
\begin{align*}
    b \pm t \frac{S_b}{\sqrt{n-2}} &= 4.29 \pm t \frac{\sqrt{486.91}}{.95(3)} \\
    &= 4.29 \pm (2.353)(22.07) \\
    &= 4.29 \pm 51.93 \\
    &= [56.22, -47.64]
\end{align*}
\]
Time Series Analysis

The trend of growth rate of assets

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>2.00</td>
<td>18.94</td>
<td>(37.88)</td>
<td>4.00</td>
</tr>
<tr>
<td>1989</td>
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<td>23.67</td>
<td>(23.67)</td>
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<td>1990</td>
<td>0.00</td>
<td>27.89</td>
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<td>0.00</td>
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<td>1991</td>
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<td>1992</td>
<td>2.00</td>
<td>14.41</td>
<td>28.82</td>
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<tr>
<td></td>
<td>0.00</td>
<td>103.87</td>
<td>(13.77)</td>
<td>10.00</td>
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</table>

\[ a = \bar{Y} = \frac{\sum Y}{n} = 113.09 \]

\[ b = \frac{\sum XY}{\sum X^2} = -0.086 \]

\[ Y_c = a + bX = 22.62 - 0.086x \]
The trend of growth rate of net profit

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>2.00</td>
<td>30.09</td>
<td>60.18</td>
<td>4.00</td>
</tr>
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<td>1989</td>
<td>1.00</td>
<td>47.58</td>
<td>47.58</td>
<td>1.00</td>
</tr>
<tr>
<td>1990</td>
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<td>1991</td>
<td>1.00</td>
<td>25.65</td>
<td>25.65</td>
<td>1.00</td>
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<tr>
<td>1992</td>
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<td>4.00</td>
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<tr>
<td>2000</td>
<td>0.00</td>
<td>250.74</td>
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<td>10.00</td>
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</table>

\[ a = \bar{Y} = \frac{\sum Y}{n} = \frac{508.47}{5} = 101.69 \]

\[ b = \frac{\sum XY}{\sum X^2} = \frac{57.51}{10} = 5.751 \]

\[ Yc = a + bX = 101.69 - 5.751X \]
**Small - seale bank group**

Regression Analysis

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X^2</th>
<th>Y^2</th>
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<td>124.60</td>
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<td>(6,932.84)</td>
<td>3,240.71</td>
<td>122,574.17</td>
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\[
\bar{X} = 24.92 \\
\bar{Y} = (56.25) \\
b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2} \\
= \frac{5(-6,932.84)-(124.60)(-281.24)}{5(3,240.71)-(124.60)^2} \\
= 0.56 \\
a = \bar{Y} - b\bar{X} \\
= (-56.25)-(0.56)(24.92) \\
= -70.21
Correlation of Analysis

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>(X-\bar{X})</th>
<th>(Y-\bar{Y})</th>
<th>(X-\bar{X})(Y-\bar{Y})</th>
<th>(X-\bar{X})^2</th>
<th>(Y-\bar{Y})^2</th>
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</thead>
<tbody>
<tr>
<td>1938</td>
<td>24.68</td>
<td>24.68</td>
<td>(0.24)</td>
<td>(126.43)</td>
<td>30.34</td>
<td>0.06</td>
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<td>(0.26)</td>
<td>(214.99)</td>
<td>55.90</td>
<td>0.07</td>
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<td>1990</td>
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<td>52.49</td>
<td>9.67</td>
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<td>1,051.50</td>
<td>96.51</td>
<td>11,823.95</td>
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<tr>
<td>1991</td>
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<td>6.93</td>
<td>(4.63)</td>
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<td>3,991.46</td>
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<td>113.26</td>
<td>(4.54)</td>
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<td>0.00</td>
<td>75.66</td>
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<td>106,754.99</td>
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</table>

\[ \bar{X} = 24.92 \]

\[ \bar{Y} = 56.25 \]

\[ r = \frac{\Sigma (X - \bar{X})(Y - \bar{Y})}{\sqrt{\Sigma (X - \bar{X})^2 \Sigma (Y - \bar{Y})^2}} \]

\[ = \frac{75.66}{\sqrt{(135.68)(106,754.99)}} \]

\[ = 0.019 \]
Estimating the value of variance

\[ S^2_{y,x} = \frac{\sum (y - \bar{y})^2 - b' \sum (x - \bar{x})(y - \bar{y})}{n-2} \]

\[ = \frac{106,754.99 - (0.56)(75.66)}{3} \]

\[ = 35,570.87 \]

\[ S^2_a = S^2_{y,x} \left[ 1 + \frac{\bar{x}^2}{\sum (x - \bar{x})^2} \right] \]

\[ = 35,570.87 \left[ 1 + \frac{(24.92)^2}{5 \times 135.68} \right] \]

\[ = 169,673.05 \]

\[ S^2_b = \frac{S^2_{y,x}}{\sum (x - \bar{x})^2} \]

\[ = \frac{35,570.87}{135.68} \]

\[ = 262.17 \]
Interval estimation of $\mathcal{L}$ at 90% level of confidence

\[
\hat{a} \pm t_{\frac{1-\alpha}{2}, (n-2)} \frac{S_a}{\sqrt{169.673.05}}^{.95(3)} = -70.21 \pm 2.353 (411.91) = -70.21 \pm 969.22 = -1,039.43, + 899.01
\]

Interval estimation of $B$ at 90% level of confidence

\[
\hat{b} \pm t_{\frac{1-\alpha}{2}, (n-2)} \frac{S_b}{\sqrt{262.17}}^{.95(3)} = 0.56 \pm 2.353 (16.19) = 0.56 \pm 38.09 = +38.65, -37.53
\]
### Time Series Analysis

The trend of growth rate of assets

<table>
<thead>
<tr>
<th>Year</th>
<th>X</th>
<th>Y</th>
<th>XY</th>
<th>X²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
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<td>(37.88)</td>
<td>4.00</td>
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<tr>
<td></td>
<td>0.00</td>
<td>103.87</td>
<td>(13.77)</td>
<td>10.00</td>
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</tbody>
</table>

\[
a = \bar{Y} = \frac{\sum Y}{n} = \frac{124.60}{5.00} = 24.92
\]

\[
b = \frac{\sum XY}{\sum X^2} = \frac{-12.97}{10} = -1.297
\]

\[
Y_c = a + bX = 24.92 - 1.297x
\]
The trend of growth rate of net profit

<table>
<thead>
<tr>
<th>Year</th>
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<th>Y</th>
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<td>89.08</td>
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<td>4.00</td>
</tr>
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<td>0.00</td>
<td>250.74</td>
<td>34.57</td>
<td>10.00</td>
</tr>
</tbody>
</table>

\[
a = \frac{\sum Y}{n} = \frac{-281.24}{5} = 56.25
\]

\[
b = \frac{\sum XY}{\sum X^2} = \frac{870.05}{40} = 21.75
\]

\[Y = a + bX = -56.25 + 87.00X\]
References

1. Narasri Vivanichkul, Professor, Research Methodology, Chulalongkorn University, Bangkok, Thailand (1990)

2. Petcharee Kumsup, Professor; Financial Analysis, Bangkok, Tammasart University (1988)


