Profit and Loss in the MCC

A&H 376 Topics in History

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## Introduction

In this paper I will investigate the successes and failures of the transatlantic slave trade by looking into the voyages of the Middelburgsche Commercie Compagnie (Middelburgse Commerce Company, MCC) through statistical analysis. Although the goal is to give insight into the history of the MCC, the nature of the analysis makes that this paper will more closely resemble an empirical paper. This does not, however, stand in the way of giving a meaningful historical interpretation.

A number of ships have been picked for examination, being the *Africaanse Galeij, Aurora, Brandenburg, Drie Gezusters, Eenigheid, Geertruyda en Christina, Hof van Zeeland, Jonge Willem, Mercurius, Middelburgs Welvaren, Nieuwe Hoop, Philadelphia, Prins Willem de Vijfde, Raadhuis van Middelburg, Standvastigheid, Vergenoegen, Vigilantie, Vis, Vliegende Faam, Zeemercuur* and the *Zorg*. In total 71 voyages were investigated. The first voyage left on 24 June 1732 and the last voyage returned on 22 January 1794. Voyages that were canceled halfway through because of failing equipment or war are excluded. The question of this paper is to what extent the transatlantic slave trade was, or could have been, profitable, and including these outliers will not help in concluding anything about a so-called regular transatlantic voyage. Another thing that is important to note is that what is taken into account is profits given the fixed costs of the business, such as company buildings, ships, et cetera, so conclusions in this paper are about the profitability voyages, taking into account only the variable costs of equipment and cargo and the resulting net profits.

## Data

For every ship information has been gathered from the ship's book, detailing among other things

the outgoing cargo, equipment and the profit calculations of its voyages. For every voyage the cost of the cargo and equipment and the profit was recorded and put into a data file in Stata, a statistical software package, along with the date of departure and return of the voyage, the ship's name, the number of the voyage and the captain's name, which were taken from the voyage descriptions provided by the Zeeuws Archive.

The costs and profits were taken from the current account noted at the end of every voyage's entry in the ship's books, which noted the expenses and revenues of every voyage of a ship in summary. Amounts were rounded down to the Flemish pound. The costs of equipment and cargo are taken because, of the four common costs, these were usually the most sizable and were made at the beginning of the journey, making discounting the rate of profit to the date of departure of the voyage easier. The other two costs were processed at other times. One when the ship returned to Flushing or Middelburg and the other one possibly when bills came home to be redeemed. These two costs were usually called the “costs on return” and “home-coming costs.” The first of these two does not factor into the size of investment relative to profit, since it is paid around the same time that the profit is obtained. The second cost is very hard to determine, but at any rate would be very small compared to the costs of equipment and cargo. Profits take all costs and revenues into account and is the difference between final credit and debit. Losses are straightforwardly described as negative profits.

Dummy variables were created for ships and captains that made more than five transatlantic slave trade voyages. The ships were *Geertruyda en Christina, Jonge Willem, Middelburgs Welvaren, Nieuwe Hoop, Philadelphia* and *Prins Willem de Vijfde.* The captains were Adriaan Jacobse, David Mulders, Jan Menkenveld and Johannes Noordhoek. These dummies will be used to check whether their presence had a significant effect on profitability later on.

Using the data the voyage length was calculated in days as the difference between arrival and departure and the rate of profit has been approximated in percentage by the following transformation:

$$\text{Rate of profit} = ((\text{profit}/(\text{costs of cargo and equipment}) + 1)^{365/\text{voyage length}} - 1) \times 100$$

Once again, this estimate will be a bit too high because some costs were left out, but the deviation should not be too big. It also has to be taken into account that this analysis deals with the profitability of the transatlantic slave trade voyages of the MCC, not the entire transatlantic business of the company.

Because there appeared to be a correlation between equipment costs and the length of the voyage quarterly dummies were added as well to check whether the quarter of the year in which the ship left for Africa had explanatory power. The rationale behind this was that the cost of equipment was incurred at the beginning of the voyage. If there were different expectations of the voyage length based on certain circumstances, such as the time of year that a ship left, then the cost of equipment might differ because of this expectation. A quarterly dummy can help determine whether this was the case. Otherwise it can still be that a generous equipment put less pressure on the voyagers to return quickly.

Interest rates from the Bank of England are taken from a paper by Weiller and Mirowski to compare the profits to and see whether the voyages were exceptionally profitable.

Below a table and some graphs can be found to gain more insight into some variables.

| Variable | Mean | Standard Deviation | Min | Max |
|---|---|---|---|---|
| Equipment cost | 5300.592 | 2090.201 | 2790 | 12325 |
| Cargo cost | 7730.225 | 1933.176 | 4385 | 12480 |
| Profit | 678.887 | 2598.159 | -8106 | 8787 |
| Length of voyage | 557.423 | 126.094 | 345 | 873 |
| Rate of profit | 5.171 | 12.903 | -19.09 | 31.31 |

Table 1. Descriptive statistics of a number of variables

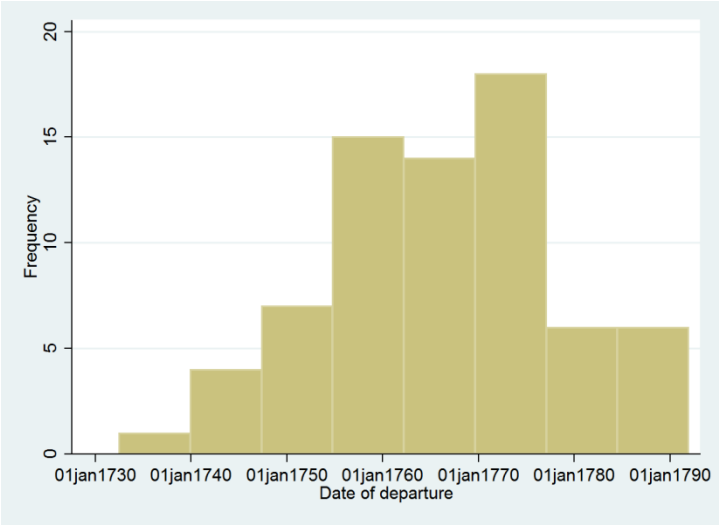


Figure 1. Histogram showing frequency of departure dates in the sample

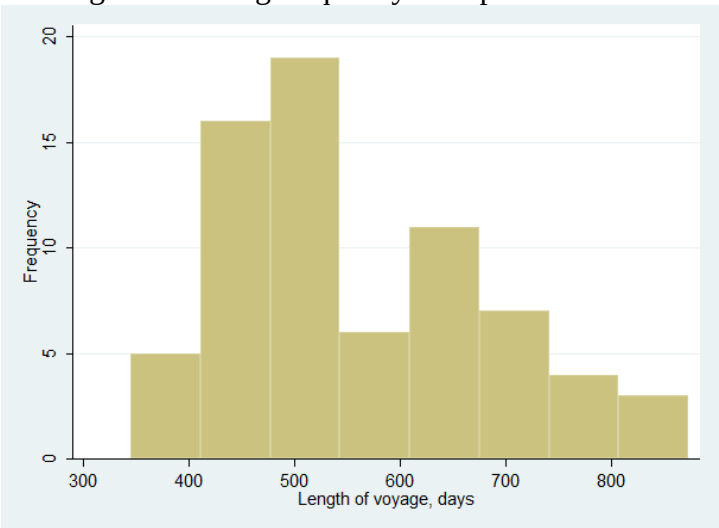


Figure 2. Histogram showing frequency of length of voyages in days

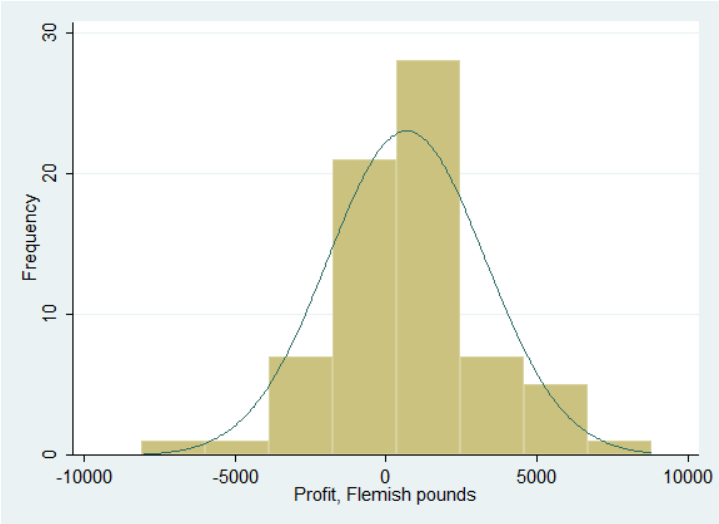


Figure 3. Histogram showing frequency of profits in Flemish pounds with normal distribution

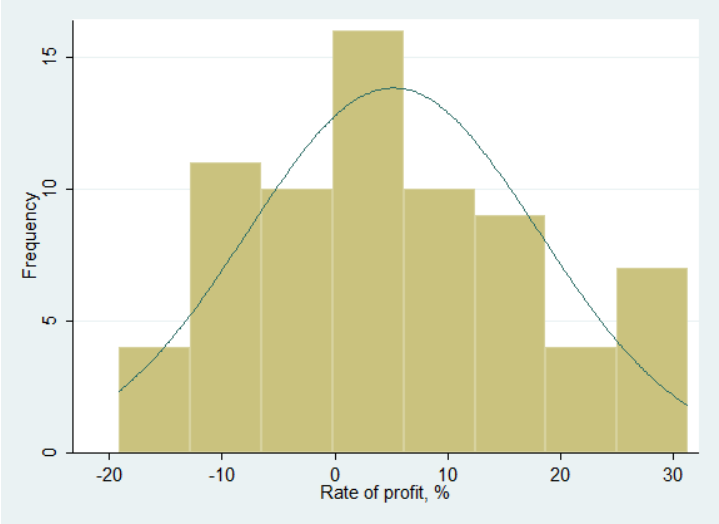


Figure 4. Histogram showing frequency of rate of profit in percentages with normal distribution

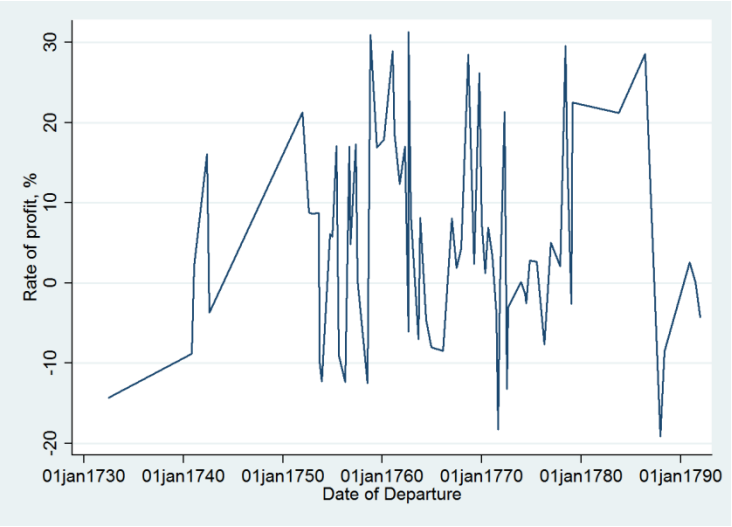


Figure 5. The rate of profit over time

## Methods

Linear regressions will be performed to determine the relation between several factors and profitability. Regressions are used to determine how big the relation between different variables is and whether they are significantly related. The assumptions for the method of estimating the parameters in the linear regression that is used in this analysis, ordinary least squares, will be checked, and if assumptions are violated this will be reported. First of all, the profits will be regressed on the costs of cargo and equipment and the length of the voyage. This means that a linear model is constructed that tries to explain variation in profits using the cost of cargo, cost of equipment and the length of the voyage as explanatory variables. Equipment should not factor into profits, but it can be expected that a

more expensive cargo would bring back higher profits. Voyage length is added because it can be expected that a longer voyage is less likely to be profitable.

After this, both equipment cost and voyage length will be regressed on the four quarters separately and for both an F-test will be performed to check whether departure in different quarters of the year affected equipment cost and voyage length differently.

Thirdly, the rate of profit will be regressed on the date of departure, the voyage length, the number of the voyage, and the dummies of ships, captains and quarters mentioned in the Data section. Using the costs of cargo and equipment is nonsensical in this case because the rate of profit already deals with profits relative to those costs. After this, an F-test will be performed to check if there was a significant difference in the rate of profits among different quarters of the year.

A t-test will be done to compare the computed rate of profit against the interest rate of the Bank of England at the time. A t-test shows whether a variable differs significantly from a given value, or whether two variables differ significantly from each other. Significant findings can have interesting implications, but are unlikely given the relatively low number of observations and the high variance in the rate of profit that can be seen in figure 4 and 5.

## Results

| | Coefficient | Standard Error | *t*-statistic | *p*-value | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| Equipment | -0.095 | 0.185 | -0.51 | .610 | -0.465 | 0.275 |
| Cargo | 0.135 | 0.197 | 0.69 | .495 | -0.258 | 0.529 |
| Length of voyage | -9.993 | 2.467 | -4.05 | <.001 | -14.916 | -5.069 |
| Constant | 5707.865 | 1458.441 | 3.91 | <.001 | 2796.804 | 8618.926 |

Table 2. Results of first regression. $R^2$ = .23, Adjusted $R^2$ = .20

The results of the regression of profits on the cost of equipment, cargo and voyage length can be found in table 2. The coefficients show the effect of a one unit increase in the explanatory variable on the dependent variable. So, for example, one Flemish pound more in cargo would increase profits by 0.135 pounds according to this model. The constant is added to capture make the model fit better, and

does not have a historically meaningful interpretation. The standard error is a measure of the error of the coefficient and is used to compute the t-statistic through the formula $t$ = coefficient/(standard error). If the variable is normally distributed this can be used to determine whether the coefficient is significantly different from 0, which is represented more easily by the *p*-value. The *p*-value shows the proportion of times that the obtained value, the coefficient in this case, can be expected if the null-hypothesis holds. The null-hypothesis is that the coefficient is not different from 0, so that there is no effect. For example, a *p*-value of .05 implies that there is a 5% chance that the same value would be obtained even when the true coefficient is not different from 0. A *p*-value of .05 is usually the threshold for rejecting the null-hypothesis, but lower values mean the null-hypothesis is even less likely. The 95% confidence interval gives the bounds outside of which the explanatory variable is different with 95% confidence. This means that if 0 lies outside of the confidence interval, the p-value is smaller than .05. The $R^2$ and Adjusted $R^2$ are a measure of explanatory power of the model. The variation in profits explained by this model is around 23% to 20%.

In this case it was found that the cost of equipment and the cost of cargo has no significant effect on profits, while the length of the voyage did. One day added to the voyage, other things being equal, would have decreased profits by 10 Flemish pounds.

The quarter in which the ship left for Africa did not affect the length of the voyage according to the F-test, with a *p*-value of .28. Its effect on the equipment cost, however, seemed to be significant at the 10% level, which is not highly significant, but is noteworthy with a *p*-value of .08.

| | Coefficient | Standard Error | *t*-statistic | *p*-value | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| Date of departure | 0.001 | <0.001 | 2.62 | .011 | <.001 | 0.002 |
| Voyage length | -0.049 | 0.012 | -4.04 | <.001 | -0.073 | -0.024 |
| Number of voyage | 0.548 | 0.618 | 0.89 | .379 | -0.691 | 1.788 |
| Adriaan Jacobse | 13.886 | 7.998 | 1.74 | .088 | -2.149 | 29.921 |
| David Mulders | -4.320 | 6.160 | -0.70 | .486 | -16.670 | 8.030 |
| Jan Menkenveld | 3.102 | 6.949 | 0.45 | .657 | -10.830 | 17.034 |
| Johannes Noordhoek | -0.190 | 6.157 | -0.03 | .975 | -12.534 | 12.154 |
| *Geertruyda en Christina* | -0.889 | 5.205 | -0.17 | .865 | -11.324 | 9.546 |
| *Jonge Willem* | 9.378 | 6.330 | 1.48 | .144 | -3.314 | 22.069 |
| *Middelburgs Welvaren* | 21.438 | 5.762 | 3.72 | <.001 | 9.886 | 32.990 |
| *Nieuwe Hoop* | 6.195 | 4.530 | 1.37 | .177 | -2.887 | 15.277 |
| *Philadelphia* | 5.207 | 6.652 | 0.78 | .437 | -8.128 | 18.543 |
| *Prins Willem de Vijfde* | -5.557 | 7.852 | -0.71 | .482 | -21.298 | 10.185 |
| First quarter | 85.251 | 26.275 | 3.24 | .002 | 32.574 | 137.929 |
| Second quarter | 88.278 | 26.520 | 3.33 | .002 | 35.109 | 141.447 |
| Third quarter | 83.402 | 26.498 | 3.15 | .003 | 30.276 | 136.528 |
| Fourth quarter | 86.841 | 26.183 | 3.32 | .002 | 34.346 | 139.335 |

Table 3. Results of second regression. $R^2$ = .57, Adjusted $R^2$ = .44

Results from the second regression can be found in table 3, where the rate of profit was regressed on a number of variables. The constant was omitted because of a statistical complication, but this constant is basically recaptured for every quarter separately in the quarterly dummies. The rate of profit seemed to increase over time when controlling for other variables. Voyage length led to a lower rate of profit, which is understandable, but the size of the coefficient is quite big. A month's delay would cause, other things being equal, a drop in the profit of around 1.5%. The number of the voyage has no significance. Adriaan Jacobse's influence was significant at the 10% level, and the ship *Middelburgs Welvaren* outperformed other ships significantly. The F-test comparing the effect of different quarters is highly insignificant, with a p-value of .61, meaning that the quarter of the year that the boat left did not influence profitability. Roughly half of the variation in the rate of profit is explained by this model, which means it is relatively successful, although there is still a lot left unexplained.

A t-test was performed to check whether the rate of profit in the voyages was significantly

different from the rate of interest. A quick investigation shows that this was not the case. The 95% confidence interval for the rate of profit, so the range within which it is impossible to claim significant difference at the 5% level, ranges from 2.12% to 8.23%. A comparison with the rates from the Bank of England shows that all rates in the period fall within this interval. From this we cannot conclude that the transatlantic slave trade voyages of the MCC were exceptionally profitable.

## Conclusion

An important caveat for interpreting this analysis is understanding that the data are not of perfect quality. For a given ship there are only so many voyages, as for a given captain, and there are only so many voyages in the entire sample. If a ship was extremely profitable on all three of its transatlantic voyages this might be because some inherent quality of the ship, but it might just have been luck. A larger sample would eliminate this problem, but in some instances it is impossible to get this. Because of this one should not be too quick to draw strong conclusions based on a marginally significant *p*-value.

That being said, there are some things that are apparent from this analysis. First of all the length of the voyage was an important factor in the profitability of transatlantic trade voyages. Roughly a fifth of the variation of profits appears to be dependent on it. The reason for this is quite simple: More time spent on sea runs up costs of crew and maintenance and gives more opportunity for accidents and deaths during the trip.

Concerning the rate of profit it can be said that according to the data it increased slightly over time. The voyage length was still important, for the same reasons stated above. As far as different captains and ships go it seems unconvincing that they influenced the rate of profit very much. The results show that *Middelburgs Welvaren* conducted voyages that were a lot more profitable than those of other ships, but there can be other factors at play here that might explain this as well, such as a crew that might change only slowly over time. No other ship was found to be either significantly profitable or unprofitable and I cannot come up with a reason why it would be different if we consider the ship

here as just a ship.

The rate of profit did not appear to be different from the rate of interest at the time, however, here is an instance where a larger sample can provide more conclusive results. Since returns were highly volatile it is hard to say whether the voyages were worth it in the end if you do not have a lot of data on those voyages.

## Sources


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