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Driven by domestic or foreign influences?

An analysis of the impact of domestic and foreign macroeconomic variables on the
Dutch stock market

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Preface

This thesis represents the end of my Financial economics master program of the faculty Erasmus School of Economics of the Erasmus University Rotterdam.

I couldn't have completed this thesis without the help of others. Therefore I would like to thank First of all my supervisor Vadym Volosovych for his guidance and feedback by e-mail, Skype or face-to-face. Besides my supervisor I would like to thank my family for their support during my study.

Applying the acquired knowledge in practice was sometimes difficult, but always informative.

Sjoerd den Boer

Rotterdam, 2011

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Abstract

This thesis in its present form is the result of the research to the relationship between the Dutch stock exchange and the domestic and foreign macroeconomic variables

The relationship was measured with a least squared regression, with dependent variable being the change in AEX (Amsterdam exchange index) and AEX industries return indices and independent variable being the domestic and foreign macroeconomic variables. The results are checked for their robustness. The most significant and robust variables that have an influence on the AEX are the Dutch - American interest differential, the US dollar exchange rate and the for inflation corrected growth of the European money supply (M3). The industry regressions show several relationships, the most important variable among the industries is the for inflation corrected growth of the European money supply (M3).

The contributions of this project are twofold. First, this thesis shows results the AEX is mostly influenced by foreign variables and especially American variables. Second, this thesis shows results regarding the different industries and their relationship with domestic and foreign macroeconomic variables.

Keywords: AEX, Macroeconomic variables, Return index, Domestic and foreign influences.

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1. Introduction

What drives the Dutch stock market? Domestic and/or foreign macroeconomic variables? Do different industries react differently to the same domestic and foreign variables? This paper examines the influence of domestic and foreign macroeconomic variables on the changes in the AEX return index and the separate industries within the AEX.

This paper uses three countries, 7 macroeconomic variables and 10 industries. The Dutch macroeconomic variables represent the domestic influence. The European, German and American macroeconomic variables represent the foreign influence, because in 2010 Germany was the biggest trading partner of the Netherlands¹ (24% of the Dutch export) and the United States of America was the biggest trading partner of the European Union².

The industry regressions measure the impact of the macroeconomic variables on different industries within the AEX, which are the basic materials, chemicals, consumer goods, financials, industrials, leisure goods, oil and gas, real estate, technology and telecom industry. All industries except for the real estate industry are currently incorporated in the AEX. Earlier companies like BAM represented the real estate industry.

Researchers have already studied the relationship between macroeconomic variables and the stock markets. Most of these papers are focused on the bigger stock markets like the Dow Jones and the Nikkei. This study focuses on the influence of both domestic and foreign macroeconomic variables on the stock market of a small open economy such as the Dutch economy. These results are also relevant for practitioners, because they can benefit from these relationships.

The main research question that this study examines is the following:

Is there is a long-term relationship between the macroeconomic variables and the growth in the return index of the AEX?

To specify the relationship, there are three sub questions, which are:

- What is the impact of the individual macro-economic variables?
- What is the impact of the macroeconomic variables on the growth of the different industries return indices?

¹ Cbs.nl

² Ec.europe.eu

- How is the influence on the dependent variable distributed between domestic and foreign influences?

The reason why this study also focuses on the relationship between the macroeconomic variables and the different industries is, because the different industries are expected to be exposed different to the macroeconomic variables and will react different from each other.

The next section describes the existing literature. Section 3 describes the data and methodology. Section 4 presents the results of the AEX regressions and the industry regressions. Section 5 presents the results of the robustness test and the last section concludes.

2. Existing literature

There are already a number of papers devoted to the relationship between macroeconomic variables and stock returns. Many papers look at American data, like Chen, Roll and Ross (1986), Chen (1991) and Fama (1981,1990).

Fama (1981) found a strong positive correlation between common stock returns and real economic variables. Chen, Roll and Ross (1986) found evidence that some macroeconomic variables explain the changes in stock returns and Chen (1991) found that the macroeconomic variables along with market dividend-price ratio are indicators of recent and future economic growth.

The macroeconomic variables that have been found to be consistent with the changes in the stock returns are Oil price (Basher and Sadorsky, 2006), Industrial production, changes in the risk premium, twists in the yield curve, unanticipated inflation, expected inflation (Chen, Roll, Ross 1986), GNP, CPI, Money supply, interest, exchange rate (Wongbangpo and Sharma, 2002).

These results illustrate which macroeconomic variables have found to be consistent with the changes in stock returns and can be used as a foundation for this paper.

The added value of this thesis research compared to existing literature is the fact that this research will look at a smaller index compared to the common used S&P 500. Beside the fact that this research looks at a different index, will this research also add value because it looks at the impact of the different industries instead of only the whole index. At last will this industry look at both domestic and foreign variables.

3. Data and methodology

In this paper the influence of the different domestic and foreign macroeconomic variables on the Dutch stock market and different industries within the Dutch stock market will be analyzed. The goal of this paper is to examine which variables influence the Dutch stock market the most and do the foreign or the domestic variables have a bigger influence?

As reference countries to examine the foreign influence on the Dutch stock market, the United States of America and Germany are chosen. The reason why these two countries are chosen as reference countries is the fact that in 2010 Germany was the biggest trading partner of the Netherlands³ (24% of the Dutch export) and the United States of America was the biggest trading partner of the European Union⁴.

3.1 Data

The data set is obtained over a period from 1983 till 2011. 1983 is used as starting point, because this is the year of incorporation of the AEX. The index is composed of a maximum of 25 of the most actively traded securities on the exchange. The composition of the AEX is reviewed four times a year, any changes made as a result of the reviews take place on the third Friday of the month. A table with the current composition of the AEX can be found in appendix B.

The dependent variables will be the stock return measured with the return index from DataStream. The return index shows the theoretical growth in value of a shareholding over a specified period, assuming that dividends are reinvested to purchase additional units of an equity or unit trust at the closing price applicable on the ex-dividend date. The return index captures both value growth and dividend.

The dependent variable, the return index, will be divided per industry segment. The return index will be divided in 8 industries, which are basic materials, chemicals, consumer goods financials, industrials, leisure goods, oil and gas, real estate, technology and telecom.

The independent variables, which are the macroeconomic variables are obtained from the OECD website⁵. The variables and the intuition behind these variables will be explained underneath.

³ Cbs.nl

⁴ Ec.europe.eu

⁵ Oecd.org

3.1.1 Variable description

The dependent variable is the change of the return index. The return index captures both value growth and dividend. From 1984 till 1988 the return index is calculated according to the following formula:

$$RI_t = RI_{t-1} * \frac{PI_t}{PI_{t-1}} * \left(1 + \frac{DY_t}{100} * \frac{1}{N}\right)$$

Equation 1 Return index until 1988

From 1988 till 2011 the RI is calculated according to the formula underneath:

$$RI_t = RI_{t-1} * \frac{P_t}{P_{t-1}}$$

Equation 2 Return index from 1988-2010

Except when $t = \text{ex-date of the dividend payment } D_t$ then:

$$RI_t = RI_{t-1} * \frac{P_t + D_t}{P_{t-1}}$$

Equation 3 Return index from 1988-2010 when $t = \text{ex-date}$

Where RI is the return index, PI is the price index, DY is the dividend yield %, N is the number of days, P is the price on ex-date and D is the dividend payment associated with ex-date. The return index variable is calculated by calculating the month-on-month changes in return.

In this paper 7 independent variables are used including the consumption, exchange rate, GDP, industrial production, inflation, interest rate differential and money supply variable.

The consumption variable is the monthly year-on-year growth of the household final consumption expenditure. Based on the general supply and demand function will an increase in demand lead to a higher equilibrium price and quantity if the demand stays unchanged. The expectation behind this variable therefore is that a growth in the consumption will result in an increase in the stock return of the AEX. This variable is divided into three consumption variables, which are the Dutch, the German and the American one. It's important to examine if the AEX is more influenced by the Dutch or foreign consumption. The German consumption is expected to have a significant influence on the AEX return index, because 24 % of the Dutch export went to Germany in 2010.

The second variable is the exchange rate variable, which is the monthly month-on-month growth of national units in the Euro zone per US-dollar (Monthly average). To correct for the introduction of the Euro, the national units per US dollar is used instead of the Guilder per US dollar and Euro per US dollar. A combination of the Guilder and Euro per US dollar rate will result in jump which will influence the results. The intuition behind this variable is that the appreciation of the dollar, will result in a better competition position for the Dutch firms, which will result in an increase of the stock return. Tilak Abeysinghe and Tan Lin Yeo (1998) found that the higher the imported input content, the less the impact of exchange rates on exports. This can have an influence on the different industries, which can react different to a change in the exchange rate. The sign of the variable shows if the AEX or the industry exports more than that they import to/from the United States of America. If the AEX or the industry exports more to the United States of America it will be positively influenced by the an increase in the US dollar exchange rate. If the exchange rate increases, this means that the national currency depreciates, it will become more attractive for Americans to buy Dutch products. If the AEX or the industry import more than that they export from the United states, then will an increase in the exchange rate have a negative influence on the return index. When the currency depreciates it will become more expensive for Dutch companies to import from the United States of America, which will have a negative influence on their return index.

The third independent variable is the GDP variable. It's measured as the monthly year-on-year growth of GDP (Total current prices) divided by the population. The GDP was available as quarterly data, the method of extrapolation is used to make it compatible to the monthly dataset. The GDP consist of four parts, which are the private consumption, gross investment, government spending and the trade balance. The expected relationship between the GDP variables and the AEX return index is a positive relationship. This expectation is based on the supply and demand function, were an increase in demand will result in a higher equilibrium price and quantity if the supply remains unchanged. The relationships of both domestic and foreign GDP variables are expected to be the same, because the Dutch economy is dependent on the American and German economy. The dependency can be seen in the 24 % of the Dutch export that went to Germany in 2010 and the fact that the United States of America was the biggest trading partner of the European Union. So an increase in the GDP per capita, may lead to an increase in demand to the products of the companies that are listed on the AEX, which can lead to a higher stock return. The GDP-consumption relationship can also be seen in the correlation matrix, which can be found in appendix A. The correlation between the GDP per capita and the national consumption is 0.74 in the United States of America, 0.67 in the Netherlands and 0.02 in Germany. The relationship in United States of America and the Netherlands is very strong. The GDP per

capita variable is divided into three variables, which are the Dutch, the German and the American one.

The fourth independent variable is the industrial production variable. The industrial production variable is the monthly year-on-year growth based on the 2005=100 production of the total industry. An increase in the industrial production could result in an increase in the demand, which will result in an increase in the AEX return index. The correlation matrix shows that the industrial production-consumption relationship is very strong in the United States of America with a correlation of 0.67. The relationship is weaker in Germany and the Netherlands with a correlation of 0.36 and 0.17. The expected influence of this variable on the AEX return index is positive. This expectation is based on the supply and demand function, where an increase in demand leads to a higher equilibrium price and quantity if the demand stays unchanged. It's important to examine if the industrial production from the USA or Germany is more important to the return index of the AEX compared to the Dutch industrial production growth. The industrial production variable is divided into three variables, which are the Dutch, the German and the American one.

The inflation variable is the fifth independent variable. The inflation variable is calculated by computing the month-on-month difference of the consumer price inflation. The difference is calculated instead of the growth, because there were periods where the inflation was zero. The impact of inflation on the return of the AEX is theoretically ambiguous. In Michael Sarel's paper (1996), he found a structural break at 8 %, where after inflation impacted negatively on growth of the economic development. If the inflation is lower than 8 % Sarel (1996) didn't find any significant influence on the economic growth. The maximum inflation of Germany, the Netherlands and the United States of America is 6.31, 4.48 and 6.29 %. So according to Sarel the inflation doesn't have a significant influence on the AEX return index. This result shows the advantage of maintaining price stability. The inflation variable is divided into three variables, which are the Dutch, the German and the American one. If the foreign inflation variables turn out to have a significant negative influence on the AEX return index or an industry's return index it illustrates the foreign influence on the Dutch return indices.

The interest rate differential is the sixth independent variable and is calculated by taking the month-on-month change of the differential between the long term interest of the Netherlands and Germany and the United States. The interest variable is divided into two variables, which are Netherlands-Germany and Netherlands-USA. An increase in this variable, indicates that the difference increases between the long term interest rate of the NL and the other country. Roy Harrod, John Hicks and James Meade (1936) found that the interest rate does have a negative influence on the investment saving (Good market) and a positive influence on the

liquidity preference money supply(Money market). The intuition behind this variable is that if the differential increases the Dutch economy will cool down faster compared to the other country and investor will put their money in a safe money deposit, which can lead to a decrease in the Dutch stock market. The higher the interest rate, the more money is invested in saving deposits and less money is spend on the good markets, which could have a negative influence on the Dutch stock market. This is illustrated in the figure underneath.

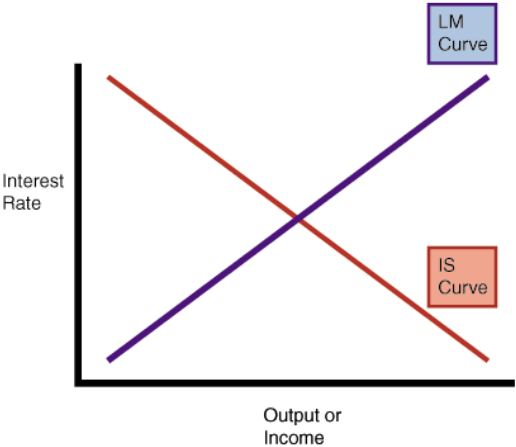


Figure 1 Monetary model

The sign of this variable indicates if the return index is more influenced by the Dutch or the foreign interest rate. If the variable has a positive effect than the AEX return index is more influenced by the foreign interest rate and the other way around.

The last independent variable is the money supply variable (M3). The M3 variable is calculated by calculating the year-on-year growth of broad money (M3) index where 2005=100. The year-on-year growth of M3 is corrected for the year-on-year price inflation, so the M3 variable will represent the real growth in money. An increase in the for inflation corrected M3, may lead to an increase in the stock market. According to the Fisher (1911) is the relationship between the money supply and the economy as following:

$$M \cdot V = P \cdot Q$$

Equation 4 Quantity theory of money

According the formula an increase in M will lead to an increase in Q if V and P remain unchanged. Where M is nation’s money supply, V is the number of times per year each currency unit is spent, P is the average price of all the goods and Q is the quantity of assets, goods and services sold during the year. The correlation matrix shows that the European money supply (M3) variable is positive correlation with Dutch GDP per capita with a

coefficient of 0.34. The M3 variable is divided into two variables, which are the M3 USA variable and the M3 Euro variable. The M3 variable is the M3 growth in Europe.

An overview of the different variables can be found underneath in table 1.

Variable	Frequency	Description	Source	Abbreviate
Return index	Monthly	The month on month change of the return index	DataStream	IR
Long term interest rate growth differentials	Monthly	The change in the differential between interest rates. MOM change.	OECD	I
Industrial production	Monthly	Production of Total industry sa, 2005=100. YOY change	OECD	IP
Consumption growth	Monthly	Household final consumption expenditure, volume, annual growth rates in percentage. YOY growth	OECD	C
Exchange rate	Monthly	Currency exchange rates, National units per US-Dollar (monthly average). MOM growth	OECD	ER
Money supply (M3)	Monthly	Broad money (M3) Index 2005-100, SA. YOY growth. M3 YOY growth corrected for inflation YOY growth	OECD	M3
Inflation	Monthly	Consumer prices (All items), difference previous period. MOM change	OECD	INF
GDP per capita growth	Monthly	GDP per head, US dollar, current prices, current PPP's growth. YOY growth	OECD	GDP

Table 1 Variables and descriptions

3.1.2 Descriptive statistics

Table 2 and 3 show the descriptive statistics of the different macroeconomic variables, which are calculated over a period from January 1983 until March 2011. Table 4 and 5 show the correlation of the different macroeconomic variables with the change in the AEX return index. The correlation is calculated over the same period from January 1983 until March 2011. The abbreviations are a combination between the abbreviations in table 1 and the abbreviations of the three different countries, which are Germany (G), the Netherlands (NL) and the United States of America (USA).

	IPG	IPNL	IPUSA	M3USA	M3EURO	ER	CG	CNL	CUSA
Mean	0,02	0,02	0,02	0,06	0,07	0,00	0,02	0,02	0,03
Median	0,03	0,02	0,03	0,06	0,08	0,00	0,02	0,02	0,03
Maximum	0,17	0,14	0,12	0,26	0,19	0,08	0,06	0,06	0,07
Minimum	-0,24	-0,18	-0,15	-0,06	-0,11	-0,07	-0,01	-0,03	-0,02
St. dev	0,06	0,04	0,04	0,06	0,07	0,03	0,02	0,02	0,02

Table 2 Descriptive statistics

	IG	IUSA	INFG	INFNL	INFUSA	GDPG	GDPNL	GDPUSA
Mean	0,00	0,00	-0,01	-0,01	0,00	0,02	0,04	0,04
Median	0,00	0,00	0,00	-0,01	-0,01	0,03	0,05	0,05
Maximum	0,06	0,24	1,26	1,12	2,02	0,08	0,08	0,12
Minimum	-0,06	-0,13	-1,36	-1,24	-2,59	-0,15	-0,05	-0,04
St. dev	0,01	0,04	0,32	0,26	0,40	0,04	0,02	0,02

Table 3 Descriptive statistics

	IPG	IPNL	IPUSA	M3USA	M3EURO	ER	CG	CNL	CUSA
Total	0,00	-0,03	0,07	-0,06	0,16	0,20	0,01	0,05	0,16
83-93	-0,01	-0,02	-0,07	-0,15	0,24	0,35	-0,17	-0,12	0,15
94-04	-0,03	-0,11	0,17	-0,02	0,19	0,27	0,08	0,16	0,14
05-11	0,03	0,04	0,09	0,05	-0,17	-0,17	0,03	-0,14	0,21

Table 4 Correlation with AEX return index

	IG	IUSA	INFG	INFNL	INFUSA	GDPG	GDPNL	GDPUSA
Total	-0,03	-0,17	0,02	-0,04	-0,04	0,00	-0,03	0,09
83-93	0,15	-0,06	0,06	0,12	-0,06	-0,02	-0,04	0,04
94-04	0,03	-0,17	-0,01	-0,19	-0,01	0,04	0,04	0,18
05-11	-0,39	-0,30	-0,25	-0,36	-0,16	-0,01	-0,13	0,08

Table 5 Correlation with AEX return index

Noteworthy is the high correlation between AEX return index and the EURO M3, exchange rate and the American consumption and interest differential. These correlations show that AEX return index is higher correlated with foreign variables than with domestic variables.

The positive correlation between the US dollar exchange rate indicates that the AEX is positive related to a depreciations of the national currency. The depreciation makes the competitor position of the Netherlands as export country the United States of America stronger.

The correlations between the macroeconomic variables are also measured and can be found in the correlation matrix table in Appendix A. The correlation matrix shows that there are high correlations between the Dutch GDP and the American GDP (0,59), German industrial production (0,78), American industrial production (0,60) and the American consumption (0,69). These correlations illustrate the intense relationship between the Dutch economy and the foreign macroeconomic variables.

3.2 Methodology

Based on the previously mentioned data the research questions will be examined. This will be done with least squared regressions. The least squared regressions will show the best linear relationship between independent variables on the dependent variable. The least squares method minimizes the sum of squares of the errors made in solving every single equation. The regression that is examined is the following:

$$\Delta \text{Return index} = a + b_1(\text{Domestic macroeconomic variables}) + b_2(\text{Foreign macroeconomic variables}) + b_3(\text{Exchange rate}) + b_4(\text{Industry dummy}) + e$$

Equation 5 LS regression

The regressions are divided into two subgroups, which are the overall AEX regressions and the industry regressions. The dependent variable of the AEX regression is the change in the AEX return index and for the industry regression it is the return index of the industry,

The industry regression measures the impact of the macroeconomic variables on different industries within the AEX. The different industries are the basic materials, chemicals, consumer goods, financials, industrials, leisure goods, oil and gas, real estate, technology and telecom industry. All industries except for the real estate industry are currently incorporated in the AEX. In former times companies like BAM represented the real estate industry.

Finally, the results will be checked for autocorrelation in the residuals with the Durbin Watson test (1950 and 1951). The Durbin-Watson statistic is calculated with the following formula:

$$d = \frac{\sum_{t=2}^T (e_t - e_{t-1})^2}{\sum_{t=1}^T e_t^2}$$

Equation 6 Durbin Watson statistic

Where e_t is the residual at time t , T is the number of observations and d is de Durbin Watson statistic. Autocorrelation can be caused by multiple reasons, but the main cause is when an important variable has been omitted. If autocorrelation is present, the estimator is still unbiased but the variance of the parameter estimates will be affected. A consequence of the affected variance is that the standard errors and t-values will be affected as well. If autocorrelation is present the regression should be adjusted with the Newey-West (1987) estimator.

4. Results

This section will describe the results of the least squared regressions. The results are divided into two different tables. Table 6 shows the results of the AEX regressions, the dependent variable of all the regressions is the change in the AEX return index. The second table, table 7, shows the industry regressions, the dependent variable of these regressions are the changes in the return indices of the different industries.

4.1 AEX regressions

The table reports coefficients of regression of AEX stock returns on the domestic and foreign variables macro economic variables. The AEX returns are measured over a period from January 1989 until March 2011.

Variable	(i)	(ii)	(iii)	(iv)	(v)
C	-0.01	0.00	0.01***	-0,01	0,00
	[-0.60]	[-0.35]	[2.54]	[-0,68]	[-0,03]
Consumption Germany	0.22				
	[0.82]				
Consumption Netherlands	0.27				
	[0.88]				
Consumption USA	0.28				
	[0.63]				
Exchange rate	0.10	0.15	0.31**		
	[0.57]	[0.90]	[1.91]		
GDP Germany	-0.02			-0,08	-0,15
	[-0.22]			[-0,76]	[-1,47]
GDP Netherlands	-0.73*			-0,62***	-0,39*
	[-1.89]			[-2,89]	[-1,92]
GDP USA	0.21			0,74***	0,74***
	[0.48]			[2,81]	[2,75]

Industrial production Germany	0.01				
	[0.09]				
Industrial production Netherlands	-0.15				
	[-1.22]				
Industrial production USA	0.24				
	[1.39]				
Inflation Germany	0.01	0.01	0.01	0,00	0,01
	[0.55]	[0.55]	[0.89]	[0,37]	[0,65]
Inflation Netherlands	0.00	-0.01	0.00	0,00	0,00
	[-0.17]	[-0.46]	[-0.14]	[-0,02]	[0,18]
Inflation USA	0.01	0.02*	0.01	0,01	0,01
	[0.96]	[1.82]	[1.38]	[1,40]	[0,84]
Interest differential Germany	-0.28	-0.36	-0.36		
	[-0.82]	[-1.07]	[-1.03]		
Interest differential USA	-0.27**	-0.31***	-0.26**		
	[-2.23]	[-2.70]	[-2.29]		
M3 EURO	0.27***	0.18***		0,22***	
	[3.26]	[2.53]		[3,06]	
M3 USA	0.12	0.01		0,00	
	[1.27]	[0.10]		[-0,03]	
Number of observations	252	252	252	252	252
R-squared	0.16	0.11	0.08	0.09	0.05

Table 6 AEX regressions

The T-statistics are given in brackets and asterisks denote the significance levels: *=10%, **= 5% and ***=1%

The AEX regressions are divided into five regressions. The first regression is the regression where all variables are included. The second and third regressions include all financial variables. The difference between the second and the third regression is that the second includes the money supply variables and the third doesn't. In the fourth and fifth regression the real economy variables are included. The correlation between the GDP and the consumption and the industrial production variable is very high, this can result in the multicollinearity problem. The high correlation is caused by the fact that the GDP exist of components like the consumption and the industrial production. Individually the GDP variable has a higher explanatory power in terms of r-squared on the AEX return index (0,04 versus the 0.01 of the industrial production and 0.02 of the consumption), this is why the consumption and the industrial production variable are excluded.

The inflation is also incorporated in the real economy regressions to correct the GDP variable for inflation. In the fourth regression the money supply variables are included and in the fifth regression not. The money supply variable is incorporated in both the financial as well as in the real economy regression, because it's debatable if the money supply is a financial or a real economy variable. The distinction between real economy and financial variables is made to see, which one explains more of the variation of the AEX return index.

All variables

In the first regression, were all variables are included, there are two significant variables at a 5 % level. The first significant variable is the Dutch - American interest rate differential. An increase in the differential between the Dutch and the American interest rate results in a negative influence on the return index of the AEX. According to the monetary model does the interest rate have a negative influence on the economy and can it be used as a tool to cool down the economy. If the variable increases, this means that the Dutch interest rates increases faster than the American one, the Dutch economy cools down faster compared to the American economy. The fact that this variable is negative and significant, indicates that the AEX return index is more influenced by the Dutch than the American interest rate. If the sign was positive instead of negative than the AEX return index was more influenced by the American interest rate.

The last significant variable is the M3EURO variable. The quantity theory of money, which was founded by Fisher (1911), tells us that if the money supply increases faster than the price and the velocity stay unchanged, the quantity will raise. This relationship can also be seen in the correlation matrix, which can be found in appendix A. The correlation matrix shows that the for inflation corrected European money supply (M3) is positive correlation with the American (0,10), Dutch (0,18) and German (0,02) consumption. If the quantity of goods

and products sold will rise, this will have a positive influence on the return index. In this regression this is the case, an increase in the European money supply (M3) variable has a positive influence on AEX return index.

Financial variables

The second regression shows that if the real economy variables are excluded, the same financial variable stay significant as in the first regression. These significant variables are the American interest rate differential and the European money supply (M3).

In the third regression all the financial variables are included, but the M3 is excluded. If we exclude the M3 variables in the financial variables regression, the exchange rate variable becomes significant. This makes sense, because they are correlated. This correlation between exchange rate and the American M3 is -0,20 and with the European M3 is 0,33. This positive correlation between the European M3 and the US dollar exchange rate is based on the fact that if the European M3 increases the national currency becomes cheaper, which will result in an increase in the US dollar exchange rate. The other way around is applicable to the American M3, if it increases the US dollar becomes cheaper and the exchange rate will depreciate. The effect of the change in the US dollar exchange rate on the AEX depends if the imports more than it exports or the other way around. The third regression shows a positive sign, which indicates that the AEX companies export more than that they import and benefit from a depreciation of the national currency. The interpretation behind this result is, that if the national unit depreciates the export competitiveness of the Dutch economy to the United States of America improves. The competitiveness improves, because it becomes cheaper for Americans to buy products from the Netherlands when the Dutch currency depreciates. The American interest rate and inflation stay significant if the M3 is excluded.

Real economy variables

The correlation between the GDP and the industrial production and consumption is very, this can result in the multicollinearity problem. The high correlation is caused, because the GDP exist of components like the industrial production and the consumption. The regression of the consumption, GDP and industrial production individually on the AEX return index growth, shows that the GDP variable has the most explanatory power in terms of r-squared (0,04 versus the 0.01 of the industrial production and 0.02 of the consumption). Because of the higher r-squared the consumption and industrial production variables are excluded and the GDP variable remains in the real economy regression.

The fourth regression includes the GDP per capita, inflation and M3. Although the inflation isn't a real economy variable it's included to correct the GDP per capita for inflation. This

regression has three significant variables, which are the American and Dutch GDP per capita and the M3 Euro variable. The American GDP per capita has a positive significant influence on the AEX return index growth. This illustrates the positive relationship between the Dutch stock exchange and the American economy.

The Dutch GDP has a negative influence on the AEX return index. This results isn't very logical, an explanation for this result could be that the AEX is ahead of the GDP and the GDP can't catch up with fast movements of the AEX. So it could be that during the financial crisis (2007-2009) the Dutch GDP was still increasing while the AEX Stock return was already declining and later on the other way around. This will be verified with the robustness check in chapter 5. In the figure underneath, it is clearly to see, that the growth in the AEX return index is negative when the Dutch GDP growth is positive and the other way around. This is caused by the fact that the AEX return index is ahead of the Dutch GDP.

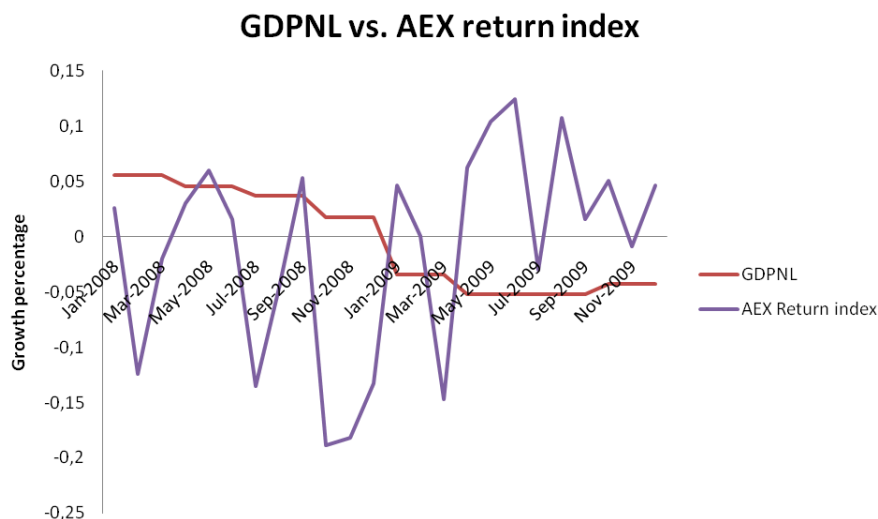


Figure 2 GDPNL vs. AEX return index

The M3 Euro variable is significant at a 1 % level and has a positive sign. The intuition behind this result is the same as in the first regression. If the money supply increases faster than the price level, this will have a positive effect on the economy according to the quantity theory of money.

In the fifth regression, the GDP and inflation variables are included and the M3 variables are excluded. The fifth regression shows positive significant result at a 1 percent level for the American GDP. The explanation for these result is the same as explained at regression 4.

All the AEX regressions are tested for autocorrelation with the Durbin-Watson test. The Durbin-Watson test didn't found significant evidence at a 5 percent level for the autocorrelation in the errors in the AEX regressions.

Quite remarkable is the pattern of the regressions, which show that the AEX return index is mostly influenced by foreign variables and in particular the American GDP and the European money supply (M3). Based on the R-squared, the conclusion can be made that the financial variables (0.11 and 0.08) explain more of the variance than the real economy variables (0.09 and 0.05).

4.2 Industry regressions

The period from March 2001 until December 2009 is chosen as time period for the industry regressions. Over this period all the data for every industry was available, this makes it easier to compare the results.

The table reports coefficients of regression of the industry stock returns on the domestic and foreign variables macro economic variables. The industry returns are measured over a period from March 2001 until December 2009.

	Basic materials	Chemicals	Consumer goods	Financials	Industrials	Leisure goods	Oil and gas	Real estate	Technology	Telecom
C	-0.03 [-1.16]	-0.03* [-1.83]	0.01 [0.65]	-0.02 [-0.52]	-0.02 [-0.55]	-0.01 [-0.61]	-0.02 [-1.34]	0.02 [1.18]	-0.05 [-1.22]	-0.02 [-0.84]
EXCHANGE	-1.08*** [-2.74]	-0.29 [-1.14]	0.29 [1.24]	-0.82* [-1.80]	-0.38 [-0.83]	0.19 [1.13]	0.14 [0.63]	0.01 [0.06]	0.00 [0.00]	-0.16 [-0.52]
GDPGR	0.74 [0.95]	-0.06 [-0.12]	0.65 [1.42]	0.43 [0.48]	0.74 [0.82]	-0.18 [-0.54]	-0.47 [-1.07]	0.28 [0.61]	0.24 [0.21]	1.10* [1.75]
GDPNL	-1.18** [-2.02]	-0.51 [-1.36]	-0.73*** [-2.13]	-1.51*** [-2.25]	-1.54*** [-2.27]	-0.17 [-0.69]	-0.25 [-0.77]	-0.68* [-1.94]	-2.03*** [-2.34]	-1.60*** [-3.38]
GDPUSA	0.58 [1.22]	0.59* [1.94]	0.24 [0.86]	1.09** [2.00]	0.60 [1.10]	0.26 [1.29]	0.54** [2.04]	0.45 [1.58]	1.17* [1.67]	0.60 [1.56]
INFLATIONGR	0.05* [1.69]	-0.02 [-1.05]	0.03 [1.46]	0.03 [0.83]	0.03 [0.78]	0.02 [1.21]	0.02 [1.24]	0.03 [1.40]	0.03 [0.67]	0.03 [1.05]
INFLATIONNL	0.02 [0.61]	0.01 [0.34]	-0.01 [-0.60]	0.04 [0.88]	0.03 [0.68]	0.02 [1.02]	-0.02 [-0.77]	0.01 [0.29]	0.00 [-0.06]	0.04 [1.19]
INFLATIONUSA	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.00	-0.01	-0.02

	[0.14]	[-0.09]	[0.34]	[-0.59]	[-0.60]	[-1.27]	[0.48]	[-0.04]	[-0.47]	[-1.13]
INTERESTGR	-1.79***	0.37	-1.30***	-2.87***	-2.42***	-0.48	0.04	-1.31***	-3.10***	-0.33
	[-2.21]	[0.71]	[-2.71]	[-3.07]	[-2.57]	[-1.38]	[0.08]	[-2.69]	[-2.57]	[-0.50]
INTERESTUSA	-0.49*	-0.25	-0.09	0.01	-0.04	-0.01	0.04	-0.02	-0.03	-0.04
	[-1.93]	[-1.57]	[-0.62]	[0.05]	[-0.13]	[-0.10]	[0.28]	[-0.13]	[-0.07]	[-0.21]
M3EURO	0.52***	0.34***	0.14	0.31	0.40*	0.18**	0.27***	0.00	0.58*	0.35***
	[2.49]	[2.57]	[1.17]	[1.30]	[1.67]	[1.99]	[2.28]	[-0.03]	[1.88]	[2.08]
M3USA	0.22	0.19	-0.08	0.05	0.23	0.05	0.11	-0.06	0.52	0.19
	[0.85]	[1.13]	[-0.49]	[0.17]	[0.76]	[0.47]	[0.73]	[-0.37]	[1.35]	[0.91]
Number of observations	106	106	106	106	106	106	106	106	106	106
R-squared	0.35	0.12	0.26	0.25	0.19	0.15	0.12	0.22	0.20	0.18

Table 7 Industry regressions

The T-statistics are given in brackets and asterisks denote the significance levels: *=10%, **= 5% and ***=1%

The table shows that the different industries interact differently with the macroeconomic variables. It's also noticeable that the industries interact different with foreign variables, but most of the industries are influenced by American variables like the basic materials, financials and oil and gas industry.

The most important variables among all industries are the American and Dutch GDP per capita, the exchange rate, the German interest rate differential and the European money supply (M3). These variables will be explained underneath.

American GDP per capita

The relationship between the American GDP per capita growth and the financials and oil and gas industry is strong. The relationship is caused by the fact that the Dutch industries export their products/ deliver their services to the United States of America. When the American consumption and/or industrial production increases, this will result in an increased demand for the Dutch industries, which eventually will increase the profits and return index.

Exchange rate

When an industry exports/imports to/from the United States of America their profits are influenced by the exchange rate. The sign of the exchange rate variable is negative if the industry exports more than that they import to the United States of America. If the industry imports more, like the basic materials industry, than will an increase in the US dollar rate lead to a profit decline, because they import in dollars and their profits are in the national currency.

German interest rate differential

The German interest rate differential has a negative and significant effect on the basic materials, consumer goods, financials, industrials, real estate and the technology industry. An increase in the Dutch - German interest rate differential, results in a faster cool down of the Dutch economy compared to the German economy. The industries that are mostly influenced by a cool down of the Dutch economy, are the industries that have stronger ties to the Dutch economy than the German economy.

European money supply (M3)

The European money supply (M3) has a significant positive effect on the basic materials, chemicals and the technology industry. These results can be explained with the same quantity theory of money equation from Fisher (1911) that was used to explain the effect of the European money supply (M3) on the AEX regressions.

This relationship tells us that if the money supply increases faster than the price and the velocity will remain the same, the quantity will rise. If the quantity of goods and products sold will rise, this will have positive influence on the economy. The industries that are mostly influenced by the M3 variable are the industries that have stable prices.

The negative significant influence of the Dutch GDP on some industries can be caused by the fact the AEX is ahead of the GDP, which is described at the AEX regression results. This is also shown in figure 2. The negative influence of American and German GDP on the return index of the consumer and real estate industry can be caused by the increased foreign competition. The foreign industry can grow along with the GDP and this can result in an increased competition, which can have a negative influence on the Dutch industry's return index.

All the industry regressions are tested for autocorrelation with the Durbin-Watson test. The Durbin-Watson test didn't found significant evidence at a 5 percent level for the autocorrelation in the errors in the industry regressions.

The R-squared, which indicates how much these regressions explain of the total variation, shows that the industry regression explain more of the return indices than the AEX regressions. Especially the basic materials and consumer goods industry have a high R-squared (0.35 and 0.26).

5. Robustness check

This section will describe the check that is performed to test if the results stay robust if the time period is adjusted. The robustness check will be performed on both the AEX and the industry regressions. The robustness check is based on the crisis period. The crisis period is excluded from the regressions, because the assumption is made that it can have significant influence on the previous results. To exclude the crisis period, the period later than December 2007 is excluded. The period later than December 2007 is excluded, because 2008 is assumed to be the starting year of the financial crisis in the AEX. This can also be seen in the graph of the AEX underneath.



Figure 3 AEX

The variables are assumed to be robust if they are significant at a 5 % level in the regression until December 2009 and in the regression until 2007.

AEX robustness checks

The table reports coefficients of the regressions of the AEX return index on the domestic and foreign variables macro economic variables. The industry returns are measured over a period from January 1989 until December 2007.

Variable	(i)	(ii)	(iii)	(iv)	(v)
C	0.00	0.00	0.01***	-0,01	-0,02
	[-0.18]	[-0.55]	[3.25]	[-0,33]	[-1,10]
Consumption Germany	-0.01				
	[-0.04]				

Consumption Netherlands	0.38				
	[1.30]				
Consumption USA	-0.35				
	[-0.78]				
Exchange rate	0.27	0.31*	0.50***		
	[1.59]	[1.84]	[3.11]		
GDP Germany	0.05			-0,47*	-0,13
	[0.42]			[-1,75]	[-1,31]
GDP Netherlands	-0.47			-0,01	-0,02
	[-1.03]			[-0,11]	[-0,10]
GDP USA	0.27			0,46	0,78***
	[0.58]			[1,38]	[2,36]
Industrial production Germany	-0.02				
	[-0.14]				
Industrial production Netherlands	-0.18				
	[-1.47]				
Industrial production USA	0.30				
	[1.72]				
Inflation Germany	0.00	0.00	0.00	-0,01	0,00
	[-0.20]	[-0.33]	[0.14]	[-0,44]	[-0,05]
Inflation Netherlands	0.00	0.00	0.00	0,00	0,01
	[-0.07]	[-0.27]	[0.07]	[0,32]	[0,50]
Inflation USA	-0.01	-0.01	-0.01	-0,01	-0,01
	[-0.84]	[-0.51]	[-0.62]	[-0,91]	[-1,16]
Interest differential Germany	0.29	0.24	0.28		

	[0.78]	[0.65]	[0.76]		
Interest differential USA	-0.30**	-0.34***	-0.27**		
	[-2.36]	[-2.70]	[-2.18]		
M3 EURO	0.26***	0.20***		0,26***	
	[3.19]	[3.02]		[3,57]	
M3 USA	0.13	0.05		0,03	
	[1.30]	[0.60]		[0,37]	
Number of observations					
R-squared	228	228	228	228	228
	0.17	0.13	0.09	0.05	0.03

Table 8 Robustness checks

The T-statistics are given in brackets and asterisks denote the significance levels: *=10%, **= 5% and ***=1%

All variables

When all variables are included, the American interest rate differential and the European money supply (M3) are significant. These variables were also significant in the regression until 2009. These variables are shown to have a robust effect on AEX changes.

Financial variables

The second and third regressions include the financial variables. The second regression shows significant results for the American interest rate differential and the European money supply (M3) with the same sign as in the regression until 2009. These variables are shown to have a robust effect on the AEX changes.

The third regression shows significant results for the Exchange rate and the American interest rate differential variable, these variables were also significant at a 5 % level in the regression until 2009 and are shown to have a robust effect on the AEX changes.

Real economy variables

The fourth regression shows significant results at a 5 % level for the European money supply (M3), this variable was also significant in the regression until 2009 and is shown to have a robust effect on the AEX changes.

The fifth regression shows a significant result at a 5 % for the American GDP per capita, this variable was also significant in the regression until 2009 and is assumed to be robust.

All the AEX regressions are tested for autocorrelation with the Durbin-Watson test. The Durbin-Watson test didn't found significant evidence at a 5 percent level for the autocorrelation in the errors in the AEX regressions.

In a 'calm' period the financial variables still explain more of the variance in terms of r-squared than the real economy variables.

To conclude, the AEX regressions shows robust results for the American interest rate differential, the US dollar exchange rate, European money supply (M3) and the American GDP per capita variable.

Industry robustness checks

The table reports coefficients of the regressions of the AEX return index on the domestic and foreign variables macro economic variables. The industry returns are measured over a period from March 2001 until December 2007.

	Basic materials	Chemicals	Consumer goods	Financials	Industrials	Leisure goods	Oil and gas	Real estate	Technology	Telecom
C	0,01	-0,01	0,07**	0,02	0,07	0,07***	0,00	0,05	-0,05	-0,02
	[0,23]	[-0,13]	[1,96]	[0,30]	[0,85]	[2,26]	[0,00]	[1,42]	[-0,45]	[-0,42]
EXCHANGE	-0,63	-0,36	0,18	-0,86*	-0,51	0,24	0,22	-0,10	0,09	-0,47
	[-1,44]	[-0,99]	[0,74]	[-1,82]	[-0,85]	[1,07]	[0,68]	[-0,35]	[0,12]	[-1,13]
GDPGR	0,75	-0,18	0,28	0,34	0,54	-0,07	-0,50	-0,10	0,11	1,04
	[0,91]	[-0,26]	[0,61]	[0,39]	[0,48]	[-0,18]	[-0,80]	[-0,19]	[0,07]	[1,34]
GDPNL	-1,69	-0,90	-1,43***	-1,64	-2,68*	-1,32***	-0,54	-0,92	-2,15	-1,62*
	[-1,61]	[-1,03]	[-2,46]	[-1,46]	[-1,88]	[-2,49]	[-0,68]	[-1,41]	[-1,15]	[-1,65]
GDPUSA	-0,22	0,04	-0,74*	0,56	-0,67	-0,72***	0,32	0,06	-0,28	0,29
	[-0,31]	[0,06]	[-1,93]	[0,75]	[-0,72]	[-2,05]	[0,62]	[0,13]	[-0,23]	[0,44]
INFLATIONGR	0,01	-0,02	0,02	0,00	0,00	0,02	0,03	0,02	0,00	0,01
	[0,16]	[-0,96]	[1,30]	[-0,08]	[-0,01]	[1,42]	[1,25]	[0,83]	[0,02]	[0,25]

INFLATIONNL	0,04	0,01	0,02	0,07	0,07	0,03	-0,02	0,02	0,04	0,07*
	[0,88]	[0,41]	[0,81]	[1,73]	[1,30]	[1,32]	[-0,67]	[0,84]	[0,55]	[1,82]
INFLATIONUSA	-0,02	-0,01	-0,02	-0,05***	-0,03	-0,02	0,01	-0,01	-0,02	-0,02
	[-0,80]	[-0,45]	[-1,64]	[-2,03]	[-1,03]	[-1,52]	[0,42]	[-0,99]	[-0,43]	[-0,84]
INTERESTGR	-0,86	0,12	-1,11*	-1,97	-2,55*	-1,06*	0,27	-0,66	-3,95**	-1,55
	[-0,77]	[0,13]	[-1,78]	[-1,63]	[-1,67]	[-1,86]	[0,32]	[-0,94]	[-1,97]	[-1,47]
INTERESTUSA	-0,51*	-0,48**	-0,23	-0,28	-0,33	-0,24*	0,00	0,02	-0,61	-0,30
	[-1,75]	[-1,97]	[-1,41]	[-0,90]	[-0,83]	[-1,66]	[-0,01]	[0,10]	[-1,18]	[-1,10]
M3EURO	0,70***	0,55***	0,50***	0,41	0,79***	0,45***	0,33*	0,14	1,02***	0,50***
	[2,75]	[2,58]	[3,50]	[1,50]	[2,28]	[3,51]	[1,71]	[0,86]	[2,24]	[2,07]
M3USA	0,29	0,29	0,04	-0,03	0,27	0,02	0,09	-0,11	1,23**	0,37
	[0,87]	[1,02]	[0,23]	[-0,10]	[0,59]	[0,15]	[0,35]	[-0,53]	[2,05]	[1,16]
Number of observations	82	82	82	82	82	82	82	82	82	82
R-squared	0.21	0.17	0.32	0.20	0.17	0.35	0.14	0.09	0.21	0.25

Table 9 Industry robustness checks

The T-statistics are given in brackets and asterisks denote the significance levels: *=10%, **= 5% and ***=1%.

The table shows that when the crisis period is excluded, the results became less significant or not significant at all. This means that the crisis period had an influence on the previous results. However there are some variables that stayed significant at a 5 % level when the crisis period is excluded. These results are robust and are summed up in the table underneath.

Industry	Robust variables
Basic materials	European money supply (M3)
Chemicals	European money supply (M3)
Consumer goods	Dutch GDP per capita (-)
Financials	-
Industrials	-
Leisure goods	European money supply (M3)
Oil and gas	-
Real estate	-
Technology	German interest rate differential
Telecom	European money supply (M3)

Table 10 Robust variables

The most important variable is the European money supply (M3). Other variables that stayed significant are the Dutch GDP and the German interest rate differential.

Dutch GDP per capita

The most remarkable robust result is the negative relationship between Dutch GDP per capita and the consumer goods industry's return index. In other words the growth of the Dutch GDP has a negative effect on the consumer goods industry's return index growth. An explanation for this result could be that the consumer goods companies that are listed on the AEX are more dependent on other economies than the Dutch economy. An increase in the Dutch GDP could go along with the increase in the demand for the Dutch consumer goods companies, which are not listed on AEX. The increase in demand for these consumer goods companies could have a negative influence on the return index of the consumer goods industry on the AEX, because they're competitors of each other.

European money supply (M3)

The positive relationship of the for inflation corrected growth of the European money supply (M3) and the return indices of several industries can be explained with previously mentioned quantity theory of money. This relationship tells us that if the money supply increases faster than the price and the velocity stay unchanged, the quantity will raise. The industries that are mostly influenced by the money supply variables, are the industries that have stable prices.

German interest rate differential

The German interest rate differential has a negative and significant effect on the technology industry. An increase in the Dutch - German interest rate differential, results in faster cool down of the Dutch economy compared to the German economy. The industries that are mostly influenced by a cool down of the Dutch economy, are the industries that have stronger ties to the Dutch economy than the German economy.

All the industry regressions are tested for autocorrelation with the Durbin-Watson test. The Durbin-Watson test didn't found significant evidence at a 5 percent level for the autocorrelation in the errors in the industry regressions.

To conclude, the industry regressions show robust results for the Dutch GDP per capita, the for inflation corrected European money supply (M3) and the Netherlands-German interest rate differential.

6. Conclusion

The goal of this paper was to answer the main question if there is a long-term relationship between macroeconomic variables and the stock returns of the AEX and if so what kind of relationship.

The regressions provide evidence that there is a relationship between AEX stock return and several macro economic variables. The AEX regressions showed that there were four robust variables that had significant influence at a 5 % level. These variables are the American interest rate differential and GDP per capita, the US dollar exchange rate and the European money supply (M3) variable. The American interest rate differential has a negative influence on the AEX returns and the US dollar exchange rate and the European money supply (M3) has a positive influence on the AEX returns.

Another goal of this paper was to examine the influence of domestic and foreign macroeconomic variables. The domestic influence on the AEX return index is represented by the American interest rate differential, which is the difference between the Dutch and American long term interest rate. The foreign influence on the AEX return index is represented by the European money supply (M3), the American GDP and the US dollar exchange rate.

The last goal was to examine if different industries within the AEX react different to the macroeconomic variables. The industry regressions provide evidence that the industries react in a different way on changes in the domestic and foreign macroeconomic variables. This thesis found evidence that the growth of Dutch GDP per capita has a negative influence on the consumer goods industry's return index. The Dutch - German interest rate differential has negative influence on the Technology industry's return index, which indicates that the Dutch technology industry is more influenced by the Dutch interest rate than the German one. At last found this thesis evidence that the for inflation corrected European money supply (M3) has a positive significant effect on the basic materials, chemicals, leisure goods and the telecom industry.

To conclude, this paper found supporting evidence that the AEX is positively influenced by the for inflation corrected European money supply (M3), American GDP per capita and US dollar exchange rate and negatively influenced by the Dutch - American interest rate differential. The industries within the AEX react differently from each other on changes of the macroeconomic variables. The most important variable among the industries was the for inflation corrected European money supply (M3).

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Appendix A Correlation matrix

The table reports correlation of the macro economic variables. The correlations are measured over a period from January 1983 until January 2011. NL, GR and USA represent the three different countries, which are the Netherlands, Germany and the United States of America. The abbreviates C, E, GDP, IP, INF, I and M3 indicate the consumption, Exchange rate growth, Gross domestic product, Industrial production, Inflation, Interest rate differentials and the money supply.

	CGR	CNL	CUSA	E	GDPGR	GDPNL	GDPUSA	IPGR	IPNL	IPUSA	INFGR	INFNL	INFUSA	IGR	IUSA	M3EURO	M3USA
CGR	1																
CNL	0,48	1															
CUSA	0,15	0,55	1														
E	0,01	0,08	0,06	1													
GDPGR	0,02	0,11	0,5	-0,07	1												
GDPNL	0,34	0,67	0,52	0,08	0,25	1											
GDPUSA	0,24	0,47	0,74	0,06	0,51	0,59	1										
IPGR	0,17	0,36	0,31	-0,01	0,30	0,78	0,6	1									
IPNL	0,10	0,36	0,24	0,09	0,20	0,52	0,43	0,54	1								
IPUSA	0,13	0,47	0,68	0,06	0,39	0,60	0,80	0,57	0,43	1							
INFGR	0,00	0,03	-0,02	0,02	-0,12	0,07	0,06	0,07	0,10	0,07	1						
INFNL	0,06	0,13	0,03	0,08	-0,02	0,16	0,08	0,16	0,06	0,13	0,32	1					
INFUSA	0,13	0,02	0,13	-0,16	0,14	-0,06	0,13	0,08	0,18	0,17	0,38	0,29	1				
IGR	-0,03	0,09	-0,04	0,02	-0,03	0,13	0,02	0,03	0,06	-0,03	-0,04	0,05	-0,05	1			
IUSA	0,06	0,13	-0,02	-0,21	0,09	0,26	0,06	0,16	0,08	0,02	-0,07	-0,07	-0,12	0,28	1		
M3EURO	0,02	0,18	0,10	0,33	-0,13	0,34	0,21	0,16	0,12	0,15	0,03	-0,05	0,14	0,06	0,02	1	
M3USA	0,15	-0,18	-0,02	-0,20	0,10	-0,07	0,04	0,13	0,04	-0,05	0,12	0,16	-0,11	-0,04	0,02	-0,49	1

Table 11 Correlation matrix

Appendix B AEX composition

Company	ICB Sector	Ticker symbol	Index weighting (%)
Aegon	life insurance	AGN	2.85
Ahold	food retailers and wholesalers	AH	4.06
Air France-KLM	airlines	AF	0.99
Akzo Nobel	specialty chemicals	AKZA	4.01
Aperam	iron and steel	APAM	0.38
ArcelorMittal	iron and steel	MT	7.09
ASML	semiconductors	ASML	3.91
Boskalis	heavy construction	BOKA	0.77
Corio	retail REITs	CORA	1.53
DSM	specialty chemicals	DSM	2.83
Fugro	oil equipment and services	FUR	1.25
Heineken	brewers	HEIA	3.88
ING Group	life insurance	INGA	11.64
KPN	fixed line telecommunications	KPN	5.66
Philips	consumer electronics	PHIA	6.51
PostNL	delivery services	PNL	0.84
Randstad Holding	business training and employment agencies	RAND	1.31
Reed Elsevier	publishing	REN	2.38
Royal Dutch Shell	integrated oil and gas	RDSA	15.59

SBM Offshore	oil equipment and services	SBMO	1.10
TNT Express	delivery services	TNTE	1.01
TomTom	telecommunications equipment	TOM2	0.20
Unibail-Rodamco	retail REITs	ULA	5.24
Unilever	food products	UNA	13.36
Wolters Kluwer	publishing	WKL	1.62

Table 12 AEX composition