



Universitetet
i Stavanger

**FACULTY OF SOCIAL SCIENCES,
UIS BUSINESS SCHOOL**

MASTER'S THESIS

STUDY PROGRAM:

Master's in Business Administration

THESIS IS WRITTEN IN THE FOLLOWING
SPECIALIZATION/SUBJECT:

Applied Finance

TITLE:

Comparative Analysis of Technology and Conventional Mutual Funds' Performance
during Financial Crisis and Non-Crisis Periods.

AUTHOR(S)

Candidate number:

4034

.....

4099

.....

Name:

Arne Lone Rasmussen

.....

Kenth Stian Norem

.....

SUPERVISOR:

Bernt Arne Ødegaard



Faculty of Social Sciences

UiS Business School

MØAHOV – Master's Thesis

**Comparative Analysis of Technology and Conventional
Mutual Funds' Performance during Financial Crisis and
Non-crisis Periods**

Authors:

Arne Lone Rasmussen

Kenth Stian Norem

Supervisor:

Bernt Arne Ødegaard

Acknowledgments

With this master's thesis, we conclude our Master's Degree in Business Administration with specialization in Applied Finance at the University of Stavanger Business School. In today's global market, where last year's iPhone is not deemed good enough today, and people are rewarded for driving electric cars instead of the classic car with gasoline, almost everything we use is based on technology and innovations. We are both fascinated by these innovations and wish to combine this fascination with our interest in the topic of investing. Therefore, we chose the topic of performance analysis in order to look at the possibility of technology-outperforming conventional sector.

We thank our supervisor Bernt Arne Ødegaard for his helpful guidance and constructive feedback during the process of writing this thesis.

Also, thank our friends and families for their support and encouragement during this time.

Arne Lone Rasmussen & Kenth Stian Norem

Stavanger, June 2019

Abstract

Within the last couple of decades, technology has completely changed our way of living; i.e. the way we think, travel, work and conduct daily routines. In this thesis we will examine the performance of technology- and conventional mutual funds in the global market through the last 18 years. In doing so, we will look at previous bubble-burst and the possibility of a “peso problem” in today’s technology sector. More specifically, the study aims to investigate whether the innovations and popularity of technology mutual funds enable the funds to perform better compared to conventional mutual funds in terms of risk, return and alpha determinant.

Our study found that technology funds yielded slightly lower risk-adjusted returns and alpha values through the first sub-period, as a result of the aftermath from dot-com bubble. During the next sub-period involving the era of financial crisis, technology funds performed solid in all measures compared to their counterparts, with significant higher alpha values and risk-adjusted returns. The same tendencies continued through our last sub-period from 2011 until 2019, resulting in a total period with solid performance from the combined technology sector.

Table of Contents

Acknowledgments	I
Abstract	II
1. Introduction	1
2. Background.....	3
3. Sample Selection and Data Description	6
3.1 Data.....	6
3.2 Methodology	10
3.2.1 Hypothesis testing	10
4. Results	12
4.1 Before the financial crisis	13
4.2 During the financial crisis	15
4.3 After the financial crisis.....	16
4.4 Total period	18
5. Discussion	20
6. Conclusion and recommendation	22
Bibliography.....	24
Appendix.....	26

List of Figures and Tables:

Figure 1: Annual Excess Return – Total period	8
Table 1: Funds Overview	6
Table 2 Correlation of Technology funds - Total period.....	9
Table 3 Correlation of Conventional funds - Total period	9
Table 4 One-factor Alpha – All periods	12
Table 5 Four-factor Alpha – All periods.....	13
Table 6 Annual return – All periods (2001-2019).....	26
Table 7 Analysis tools - Before crisis:.....	27
Table 8 Analysis tools - During crisis:	27
Table 9 Analysis tools - After crisis	28
Table 10 Analysis tools - Total period	28
Table 12 Four-factor model – Before crisis (Aug 2001 until Aug 2008).....	30
Table 13 Four-factor model – During crisis (Aug 2008 throughout 2010).	31
Table 14 Four-factor model – After crisis (Jan 2011 throughout 2018).....	32
Table 15 Four-factor model – Total period (2001-2019)	33
Table 16 Correlation technology funds – Sub-periods (2001-2019).....	34
Table 17 Correlation conventional funds – Sub-periods (2001-2019).	35
Table 18 Covariance technology funds – All periods (2001-2019).	36
Table 19 Covariance conventional funds – All periods (2001-2019).	37

1. Introduction

The term “technology” can be defined in several ways. The following definition is in our opinion the most suitable: “Products and processes used to simplify our daily lives” (Ramey, 2013). Through our thesis we investigate whether technology funds over the time-period from 2001 to 2019 have performed better than conventional mutual funds, including whether technology funds yielded higher returns due to a potential higher risk. Technology selected shares dominance the of the US equity market. S&P and Dow John Indices committees are facing the same problem as investors – “how do you manage diversification when tech is eating the world?” (Colas, 2018) In addition, we investigated if technology funds have a potential higher risk in its portfolio, compared with conventional funds - looking at a potential “peso-problem”. The analysis is conducted with data from a total of twenty funds, 10 technology funds and 10 conventional funds.

Mutual funds have become more active in the technology sector over recent years due to the exponential growth within this sector. In the words of former FBI director, James Comey (2019): “Technology has forever changed the world we live in. We’re online, in one way or another, all day long. Our phones and computers have become reflections of our personalities, our interests, and our identities. They hold much that is important to us.” Internet is one innovation that drastically simplified our lives. The new millennium started with 11% of the world’s population using internet. The number of total users increased up to 56,8% of the world’s population in the first quarter of 2019. This drastic increase in internet use affects the whole technology sector, including the social media, online storage-services (cloud) to cell phones and making the technology sector more suitable for investment due to the growth possibilities. These factors, combined with the technology companies being more mature when going public in today’s market, result in investors and portfolio managers having an expectation of substantial revenues and, huge growth possibilities for the technology sector. Non-Technology companies are being forced to respond to advancements from big technology platforms. This result in investments in technology by non-technology companies, will give an additional benefit for the technology sector. As stated from Bill Gates (2017): “Information technology and business are becoming inextricably interwoven. I don’t think anybody can talk about one without talking about the other”.

In order to shed light on these statements, we examined the performance of technology funds and conventional funds. We observed that our sample of technology funds outperformed conventional funds on all measurements, including higher average returns and alpha values for the total period, and for the last two sub-periods. Due to an overall higher average return from our sample of technology funds, we investigated whether the yielded returns correspond to an equivalent increase in risk. We did this by analysing potential risk within the technology sector based on CAPM values, Carhart's four-factor model and risk-adjusted measurements. From our calculations we observed technology funds having a higher mean beta than the conventional funds for the total period of 18 years. Within these analyses, we found similarities regarding how key companies in the dot-com bubble were valued, in comparison to today's valuation of several of the companies within the technology sector. Valuations during the dot-com bubble were growth, rather than equity and earnings. We also saw that there may be a "peso problem" associated with today's technology sector market. We have calculated a significant higher return from technology funds than from the conventional funds even, though the risk level is close to the same for the last two periods. It could be that the higher return is justified in a potential technology market crash which we have yet to observe.

The structure of our thesis will be: Chapter 2 elaborates on the definition of technology fund and evaluate key factors leading to the dot-com bubble and the "peso problem". Chapter 3 explains how we categorize our sample funds and describe the datasets. In chapter 4 we analyse results and findings from our calculations, before we discuss the findings in Chapter 5 and conclude our thesis in Chapter 6.

2. Background

In this chapter we will look further into the terminology and how we define technology. Thereafter we will investigate both dot-com bubble and the “peso problem”.

Terminology

The meaning of “Technology” has changed significantly over the last two hundred years. In the 19th century, technology was a term rarely used in the English language. When it was used, it either referred to the study of or the description of useful arts (Crabb, 1823) or as a reference to technical education from Massachusetts Institute of Technology (MIT). Under the Second Industrial Revolution the term began its journey to what it is known for today. The first step occurred while several American social scientists translated the German concept of “Technik” into the term technology. The social scientist Read Bain’s came up with the commonly used definition: “technology includes all tools, machines, utensils, weapons, instruments, housing, clothing, communicating and transporting devices, and the skills by which we produce and use them” (Bain, 1937). On the other hand, scientists and engineers usually prefer to define technology as applied science, rather than things people make and use (MacKenzie & Wajcman, 1999). The term technology has been defined in several ways, making it difficult to define which one is the most accurate. Great shares of humankind’s technology break-throughs have contributed to simplify our daily lives, for example the light bulb, railways and computers.

Hundred years ago, products such as refrigerators, vacuum cleaner and instant coffee were new innovative products. In the 1960’s the first Fax Machine, Audio Cassette and Floppy Disk (FD) came to life. Today we do not think of these products as anything near spectacular, with the younger generation born in the 21st century will most likely never use these innovations. FD is now more or less obsolete as a result of new technological innovations such as MP3 players and music stream options. The digital revolution, also referred to as the third industrial revolution, was the start of the digital world as we know it today. Internet, computers and communication products are among the world’s biggest markets today. For instance, the estimated volume of internet users globally in 1990 was 2.8 million users. In 2000 this number had increased to 631 million, and in 2010 it had further increased to 1.8 billion. As of May 2019 there are a total of 4.4 billion users globally (Stats, 2019). The estimated percentage of the world population that use internet increased from 11% in 2000 to 56,8% in 2019. These

tendencies are much like the railway investment mania from over hundred years ago (Wolmar, 2007). When the mania stopped, railways infrastructure was already built, just as the infrastructure of technology and internet during dot-com bubble, enabling future growth after the bubble burst.

The Dot-Com Bubble

The dot-com bubble developed from 1994 to until 2000. This happened as a result of the focus on estimated growth, rather than substantive factors such as earnings and book value of equity. Companies like Netscape Communications Corporations, Lycos and Yahoo! made extremely successfully initial public offerings (IPO) in 1995 and 1996. When these companies generated a huge amount of profit for everybody that invested in them, the general interest for internet companies exploded. Several investors were eager to invest in the sector with disregard for the substantial valuation of these firms, enabling companies with negative earnings to receive attention of big investors and make successful IPO's (Matias Gama, 2017). The investors did not finance an investment but were rather buying an option just in case the firm they invested in, would be the next "big thing", and then later sell the investment once the stock-price rose. Due to the combination of rapidly increasing stock values and the investors' extreme confidence in these companies delivering future profits, made the investors overlook the traditional metrics, such as book value of equity and earnings. This resulted in a "bubble". These companies all burned cash at an alarming pace. The companies spent most of their money on expensive launch parties for new products or websites (Cave, 2000), luxury vacations for employees, unnecessary business facilities and extreme advertising campaigns. So, when there was no cash left and the companies still had not managed to turn a profit, it was only a question of time before the market would realise this and decrease the market value for several of the companies.

Gavious & Scwartz (2011) found that the market tendency after the dot-com bubble burst, was not to rely on information regarding future profitability and valuation of start-ups. Instead, the market only relied on the accounting fundamentals such as book value of equity and earnings. As the time went by, market stabilized and gradually again started to rely on estimated growth in sales as a valuation element. This development shows similarities of how investors valued companies during the dot-com bubble and how technology stock is being valued today. Again, we see companies with good IPO's without any recorded earnings of significance, like for example Snapchat and Lyft.

Peso Problem

The term “peso problem” is defined as: a situation where there is a possibility of an infrequent event to occur that will have a significant impact on the underlying assets’ prices. It would be close to impossible to predict such an event, and therefore almost impossible to reflect this in modelling the economic and financial markets for the future with references to the past (Sill, 2000). The origin of this term is unknown but is in general attributed to Milton Friedman for his observation concerning the large gap between the interest rate on Mexican bank deposits and the interest rate of comparable US bank deposits. Since we see that technology funds systematically have a higher return than conventional funds, the discrepancy could be explained with reference to the “peso problem”.

3. Sample Selection and Data Description

The following section is divided into two parts. The first part showing sample selection criteria and descriptive statistics including beta, average return, covariance and correlation. In the second part, we evaluate our sample of funds.

3.1 Data

We have obtained historical financial and economic research data from Thomson Reuters (TR). Our analysis is based on a global investment plan, with US dollar as common currency. Regarding benchmark for our funds, we have applied MSCI WORLD.

Technology funds are created to invest in shares which benefit from technology advances and improvements in relation to products, processes and services. In the selection of technology funds for our analyses, we have used the following definition: The technology funds we have picked has to consist of a minimum 75% of stocks from the Morningstar's defined technology sector market: "Companies engaged in the design, development, and support of computer operating systems and applications. This sector also includes companies that provide computer technology consulting services, and companies engaged in the manufacturing of computer equipment, data storage products, networking products, semiconductors, and components." (Morningstar, 2019). With this definition in mind, we have created four criteria of which technology funds must meet all, while the conventional funds only must meet the first three.

These criteria are:

Criteria one: The funds must focus on investing globally and being tradable on at least one recognised stock market exchange.

Criteria two: The funds must be actively managed, i.e. have objectives of outperforming its reference index. A passive fund will on the other hand aim to follow the benchmark index on return and will not be relevant for our thesis.

Criteria three: The different mutual funds must have available returns data for the whole eighteen years period we have selected. We are aware of the possible survivorship-bias. We assume, however, that such a bias is equal for both sample sets. As our purpose is to analyse and compare the difference in the sample sets, not to make general predictions on the future earnings, we assume the effect of survivorship-bias is negligible.

Criteria four: Technology based funds must have minimum 75% of their portfolio invested in the technology sector.

From the above criteria we have selected a total of twenty funds, with ten in each category as displayed in table 1. From figure 1 we observe the annual excess return for technology and conventional funds. This graph indicates conventional funds performing higher annual returns than technology funds before the financial crisis in 2008. While technology funds performed at a higher level than conventional funds during the next sub-periods as well as for the whole 18 years period.

Table 1: Funds overview

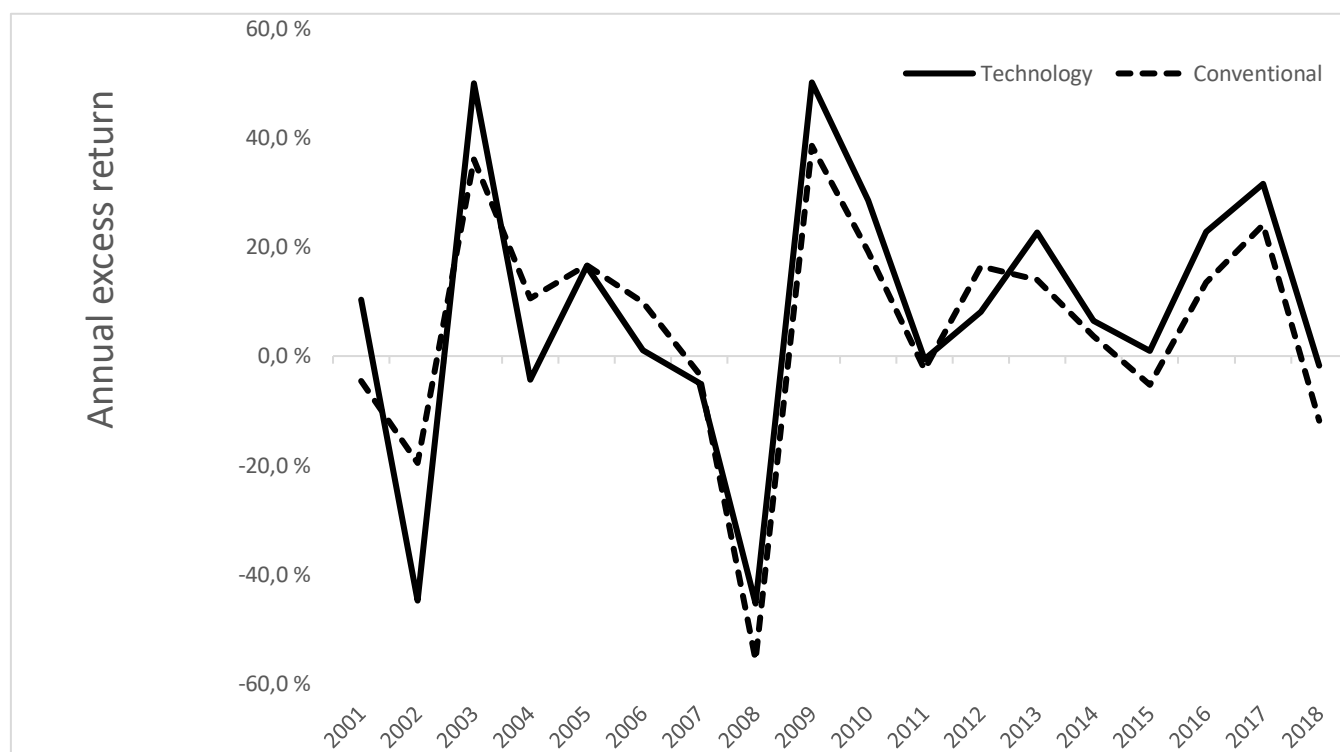
Overview of the sample of technology and conventional funds including annual average return for the different periods, and the total asset for the funds. Total asset for the funds is in million USD, and the data from the different funds were retrieved in April 2019.

Technology fund	Total Assets (mil)	Annual return			
		Total period	Before crisis	During crisis	After crisis
BlackRock Technology	1700,0	11,54 %	7,44 %	14,36 %	14,27 %
Invesco Global Technology	161,9	4,91 %	-1,49 %	8,24 %	9,50 %
Lannebo Technology	432,1	6,48 %	-2,02 %	7,58 %	13,59 %
Janus Henderson Global Technology	3030,0	8,01 %	5,01 %	14,14 %	8,79 %
Red Oak Technology	653,9	9,39 %	1,82 %	15,87 %	14,07 %
AllianzGI Technology	1600,0	8,23 %	10,15 %	11,78 %	5,48 %
Franklin Technology	2888,1	10,72 %	6,11 %	15,07 %	13,44 %
Fidelity Global Technology	4368,4	10,00 %	4,48 %	13,03 %	13,92 %
DNB Technology	2888,1	20,90 %	25,76 %	25,67 %	15,21 %
Aberdeen Global Technology	191,6	6,70 %	3,49 %	11,96 %	7,92 %
Conventional fund	Total Assets (mil)	Total Period	Before crisis	During crisis	After crisis
Putnam Global Equity	783,5	5,30 %	4,65 %	1,06 %	7,15 %
Orbis Global Equity	1326,3	9,84 %	11,42 %	11,65 %	7,91 %
DNB Global	5403,5	5,19 %	3,37 %	4,05 %	7,14 %
Fidelity Global Equities	341,5	7,13 %	6,37 %	7,04 %	7,82 %
SEB 1 Global	1451,1	5,29 %	4,73 %	-1,77 %	7,91 %
Vanguard Global Equity	57,6	6,17 %	7,41 %	1,30 %	6,55 %
Columbia Select Global Equity	447,0	6,45 %	6,27 %	4,62 %	7,15 %
CIBC Global Equity	39,2	4,19 %	3,90 %	3,65 %	4,61 %
Odin Global	534,7	7,07 %	6,61 %	8,48 %	7,04 %
SKAGEN Global	2911,9	13,11 %	23,03 %	10,32 %	5,28 %

Average annual return	Total Period	Before crisis	During crisis	After crisis
Technology fund	9,688 %	6,073 %	13,770 %	11,619 %
Conventional fund	6,973 %	7,776 %	5,041 %	6,855 %
Difference	2,715 %	-1,703 %	8,729 %	4,764 %

Figure 1: Annual Excess Return – Total period:

The graph displays the annual excess return in the time period 2001 through 2018 for technology and conventional funds. We have deducted the risk-free rate from the monthly returns. The risk-free rate has been retrieved from Kenneth French's library page at Dartmouth.



Variance-covariance-matrix and correlation

Through variance-covariance analysis calculate entries of the matrix, describing dataset of excess return from both conventional and technology funds. From Table 18 and 19 we observe that technology and conventional funds have positive covariance with the funds within the same group for the total time period from 2001 to 2019. We also observe the same pattern through sub-periods.

Correlation measures the degree of relationship between two variables, but not specifically what causes the degree of relationship. The cause of correlation may be a third, or perhaps an unseen factor. We estimated correlation through regression analysis, where the equation is estimated yielding a single number giving an estimate of how the two variables are related. From table 2 and 3 below we observed through the total period 22 of 45 possible values of correlation among technology funds with values higher than 0,90, with a mean of 0,89. In the

same period 37 of 45 conventional funds had values higher than 0,90, with a mean of 0,924. This tells us that conventional funds are more correlated over the total period. The same tendency occurred in all sub-periods, as seen in the appendix to tables 16 and 17.

Table 2 Correlation of technology funds - Total period

Correlation calculations of technology funds over the total period from 2001 to 2019.

Technology Funds	BRT	IGT	LT	JHT	FRT	FT	DT	AGT	ROT	AGT
BlackRock Technology	1									
Invesco Global Technology	0,910568455	1								
Lannebo Technology	0,867852246	0,871743	1							
Janus Henderson Technology	0,922436897	0,904561	0,864748	1						
Franklin Technology	0,951060914	0,914729	0,891029	0,930522	1					
Fidelity Technology	0,913863612	0,929025	0,918973	0,913834	0,939599	1				
DNB Technology	0,831262747	0,843463	0,87665	0,845045	0,851288	0,881157	1			
Aberdeen Global Technology	0,907091393	0,925099	0,901937	0,909052	0,939953	0,938669	0,876604	1		
Red Oak Technology	0,892882201	0,865413	0,835528	0,885541	0,940911	0,900781	0,818399	0,918643	1	
AllianzGI Technology	0,909177573	0,850266	0,821931	0,919918	0,88881	0,857036	0,79458	0,85315	0,848182	1

Table 3 Correlation of conventional funds - Total period

Correlation calculations of conventional funds over the total period from 2001 to 2019.

Conventional Funds	SG	DG	FGE	OGE	PGE	SIG	VGE	OG	CGE	CSGE
SKAGEN Global	1									
DNB Global	0,916704823	1								
Fidelity Global Equities	0,930788698	0,960605	1							
Orbis Global Equity	0,909536719	0,907494	0,90448	1						
Putnam Global Equity	0,919892393	0,955622	0,960252	0,8964	1					
SEB 1 Global	0,895113819	0,935013	0,936935	0,869226	0,919309	1				
Vanguard Global Equity	0,919547256	0,92496	0,94413	0,894528	0,954846	0,909111	1			
Odin Global	0,916954337	0,925957	0,928055	0,876924	0,919791	0,922408	0,90961	1		
CIBC Global Equity	0,920442846	0,96353	0,958455	0,909011	0,956622	0,925587	0,947248	0,941508	1	
Columbia Global Equity	0,908366584	0,934715	0,954939	0,8758	0,952878	0,895169	0,94449	0,899919	0,948576	1

3.2 Methodology

In order to evaluate the performance of the different funds when compared to an index, we used several different performance measurements; each with its own strength and weakness. The various set of performance measurements are Jensen's alpha, Sharpe-ratio, Treynor-ratio and information-ratio.

Further, we will apply one-factor model focusing on the market as a factor of risk, before analysing through Carhart's four-factor model (Carhart, 1997) applying risk factors as it's assumed that return on investment represent a separate risk-factors, thus, including Fama-French factors as priced variables to receive a greater understanding of the values (Bodie, 2011). The factors we include in the four-factor model are retrieved from Kenneth French's homepage at Dartmouth (French, 2019). With all the data collected, we have run regression analysis with the added variables, resulting in a total of four different beta-values opening for interpretations against each of the factors.

3.2.1 Hypothesis testing

We have chosen to apply this hypothesis in addition to our analysis.

Hypothesis 1:

H₀: Risk-adjusted return for technology funds is equal to risk-adjusted return for conventional funds.

H₁: Risk-adjusted return for technology funds is unequal to risk-adjusted return for conventional funds.

In order to validate our hypothesis, we decided to test the presumption in OLS as a time-series of data, checking for violations of the assumptions. We found two violations in our dataset while testing. The first violation we found were heteroscedasticity in both of our models. We applied the model of White (1980), suggesting there may be inconsistent variance in the residuals (Studenmund, 2006). This will affect the standard-error, thus affect the validity of p-values. We therefore chose to correct our model after Long and Ervins (2000) methods of a smaller selection of less than 250, with our total model consisting of a selection of 209. It is thereby corrected using heteroscedastic consistent standard-errors. We found the second

violation while performing the Durbin Watson statistic, a test for autocorrelation in the residuals (Durbin & Watson, 1951). When testing sample from all our periods, we found three examples with values registering outside the acceptable interval between 1,5 and 2,5 for the Durbin Watson test. However, in an earlier study done by Ferson & Schadt (1996), where corrections were made in relation to autocorrelation, it was concluded that such corrections were of no significance. With the background of this analysis, we will not proceed with any corrections for autocorrelation in our thesis.

4. Results

Within this chapter we will discuss the research results and outputs from the chosen methods. Tables of performance measurements are presented in the appendix. Below we provide a summary of the results divided into the different time periods before analyzing one-factor model, four-factor model and the set of analysis tools we have chosen for this thesis.

Table 4 One-factor alpha – All periods:

The following table display alpha (α) values from the one-factor model of the technology and the conventional funds for all our four different time periods in the years 2001 to 2019. At the bottom of the table one can see the average alpha for each group, and what the average alpha difference is between the technology and the conventional funds.

One-Factor model	Before crisis	During crisis	After crisis	Total period
Technology funds	Alpha (α)	Alpha (α)	Alpha (α)	Alpha (α)
BlackRock Technology	-0,08 %	0,87 %	0,43 %	0,31 %
Invesco Global Technology	-0,77 %	0,36 %	0,13 %	-0,20 %
Lannebo vision	-0,90 %	0,26 %	0,44 %	-0,14 %
Janus Henderson Global Technology	-0,29 %	0,79 %	-0,07 %	-0,03 %
Red Oak Technology	-0,71 %	0,95 %	0,45 %	0,04 %
AllianzGI Technology	0,10 %	0,64 %	-0,40 %	-0,01 %
Franklin Technology	-0,28 %	0,92 %	0,37 %	0,20 %
Fidelity Global Technology	-0,36 %	0,73 %	0,40 %	0,15 %
DNB Technology	1,27 %	1,61 %	0,43 %	0,88 %
Aberdeen Global Technology	-0,43 %	0,64 %	-0,03 %	-0,10 %
	Before crisis	During crisis	After crisis	Total period
Conventional funds	Alpha (α)	Alpha (α)	Alpha (α)	Alpha (α)
Putnam Global Equity Fund	-0,18 %	-0,30 %	-0,14 %	-0,18 %
Orbis Global Equity	0,35 %	0,62 %	-0,11 %	0,20 %
DNB Global	-0,25 %	-0,03 %	-0,18 %	-0,17 %
Fidelity Global Equities	-0,04 %	0,23 %	-0,03 %	0,00 %
SEB 1 Global	-0,16 %	-0,49 %	0,12 %	-0,11 %
Vanguard Global Equity	0,05 %	-0,28 %	-0,19 %	-0,11 %
Columbia Select Global Equity	-0,03 %	0,04 %	-0,17 %	-0,06 %
CIBC Global Equity	-0,19 %	-0,05 %	-0,34 %	-0,23 %
Odin Global	-0,03 %	0,24 %	-0,15 %	-0,09 %
SKAGEN Global	1,27 %	0,43 %	-0,35 %	0,40 %
Average alpha				
Technology fund	-0,244 %	0,778 %	0,215 %	0,111 %
Conventional fund	0,080 %	0,041 %	-0,154 %	-0,036 %
Difference	-0,323 %	0,737 %	0,369 %	0,146 %

Table 5 Four-factor Alpha – all periods:

The following table displays alpha (α) values from the four-factor model for the technology and the conventional funds for all four time periods in the years 2001 to 2019. At the bottom of the table one can see the average alpha for each group and what the average alpha difference is between the technology and the conventional funds.

<u>Four-Factor Model</u>	Before crisis	During crisis	After crisis	Total period
Technology funds	Alpha (α)	Alpha (α)	Alpha (α)	Alpha (α)
BlackRock Technology	0,27 %	0,66 %	0,50 %	0,41 %
Invesco Global Technology	-0,77 %	0,15 %	0,12 %	-0,18 %
Lannebo Technology	-0,62 %	0,00 %	0,51 %	-0,07 %
Janus Henderson Global Technology	0,02 %	0,77 %	-0,09 %	0,03 %
Red Oak Technology	-0,30 %	0,64 %	0,40 %	0,14 %
AllianzGI Technology	0,55 %	0,38 %	-0,35 %	0,06 %
Franklin Technology	0,24 %	0,76 %	0,41 %	0,32 %
Fidelity Technology	-0,11 %	0,66 %	0,37 %	0,21 %
DNB Technology	1,35 %	1,43 %	0,43 %	0,90 %
Aberdeen Global Technology	-0,11 %	0,36 %	-0,02 %	-0,01 %
Conventional funds	Alpha (α)	Alpha (α)	Alpha (α)	Alpha (α)
Putnam Global Equity	-0,19 %	-0,44 %	-0,11 %	-0,17 %
Orbis Global Equity	0,50 %	0,72 %	-0,09 %	0,25 %
DNB Global	-0,25 %	0,00 %	-0,15 %	-0,17 %
Fidelity Global Equities	0,07 %	0,15 %	0,00 %	0,04 %
SEB 1 Global	-0,24 %	-0,35 %	0,10 %	-0,12 %
Vanguard Global Equity	-0,07 %	-0,34 %	-0,18 %	-0,13 %
Columbia Select Global Equity	0,05 %	-0,01 %	-0,15 %	-0,05 %
CIBC Global Equity	-0,20 %	-0,05 %	-0,33 %	-0,23 %
Odin Global	-0,09 %	0,48 %	-0,11 %	-0,08 %
SKAGEN Global	1,40 %	0,34 %	-0,29 %	0,44 %
	Alpha (α)	Alpha (α)	Alpha (α)	Alpha (α)
Technology funds	0,053 %	0,581 %	0,227 %	0,181 %
Conventional funds	0,098 %	0,049 %	-0,130 %	-0,021 %
Difference	-0,045 %	0,532 %	0,357 %	0,202 %

4.1 Before the financial crisis

From table 1 we observe that conventional funds had a slightly higher annual return than the technology funds at 7,8% compared to 6,1%. DNB Technology had the highest annual return throughout the period of 25,8%. Skagen Global is the nearest contender with 23%. Worth mentioning is that Invesco Global Technology and Lannebo Technology are the only technology funds with negative return in this period.

Jensen's Alpha tells us how a fund has performed when compared to market expectations. If Jensen's Alpha is positive, then the performance is higher than what was expected from the

market. As shown in table 7, the technology funds Jensen's Alpha mean is negative 0,24%. The conventional funds 0,08% mean is 0,32% higher. DNB Technology registered the highest Jensen Alpha of 1,27%.

Sharpe-ratio is a measurement for an investment's risk adjusted return. Risk in the Sharpe-ratio refers to standard deviation, a measurement for volatility. From our results we can see that technology funds' Sharpe-ratio mean of 0,03, is lower than conventional funds' mean of 0,09. Out of all our funds there were only three in the technology fund group that had a negative Sharpe-ratio.

Treynor-ratio measures how much excess return is generated from each unit of risk taken on by a portfolio. Risk in the Treynor is measured by the portfolio's beta, which refers to the systematic risk. The technology funds have a mean of 1,84% and the conventional funds mean is 4,46%.

Information ratio measures the portfolios return that is greater than the returns of a benchmark, compared to the volatility of those returns. By dividing the portfolios excess return on the portfolios tracking error, we get a performance measurement over how well the portfolio has done against the benchmark. The tracking error tells us how consistent a portfolio is against the market. Low tracking error means that the portfolio is beating the benchmark over time, and a high tracking error means it get beaten over time. The technology funds have an information ratio mean of negative 6,48%, and the conventional funds registering a mean of negative 2,28%.

Regression one- and four-factor model

Alpha evaluate how the fund has performed compared to the market. A positive alpha means that the fund has outperformed its expectations. From Table 11 we can see that technology funds alpha's mean is negative 0,244%. This is 0,323% lower than the conventional funds mean at 0,08%. Two of the technology funds delivered positive alpha in this period; DNB Technology with 1,27% and AllianzGI Technology with 0,10%. Among the conventional funds there were three funds with positive alphas.

Mean beta for the technology funds is 1,61, against the conventional funds' beta mean at 1,06. All the technology funds beta is above 1. Adjusted R^2 of the period show that conventional funds have the highest explanation ratio, with a mean of 89,28%. The technology funds have a mean ratio of 68,72%.

From Table 12 in the appendix we can see our results for the four-factor. For the first period the technology funds alpha mean is 0,053% and the conventional funds alpha mean is 0,098%, making the conventional fund's performance for the first period slightly better. The technology funds' R^2 mean is 71,23%, compared to conventional funds' mean of 89,74%. The technology funds results have 18,51% less explanation rate. SMB factor mean for both technology and conventional funds are negative with respectively 0,478 and 0,021. Technology funds have a negative HML factor mean at 0,574, were the conventional funds mean is 0,095. This indicates that the technology funds are more exposed to growth companies than the conventional funds during this period. MOM factor mean for technology funds is 0,227, while for the conventional funds we found a negative mean at 0,08. The technology funds are leaning more against the momentum stocks compared to the conventional funds for this period. From the market beta of this period we can see a significant difference between the two groups were technology funds has a beta mean of 1,58 and the conventional funds have a beta mean of 1,06.

4.2 During the financial crisis

Table 8 in the appendix shows us that the annual return during the financial crisis for technology funds were 13,8%. This is 8,8% higher than conventional funds annual average return of 5% for the same period. Eight of the technology funds have a higher annual return than the annual return for the conventional funds that has the highest annual return.

Jensen's Alpha for the technology funds were all positive through the period, with a mean of 0,78%. DNB Technology has the highest number at 1,61%. Conventional funds have a positive alpha mean for this period of 0,04%. This gives us a total differential between the two groups of funds of 0,74% in favour of technology funds, making this the time-period with the largest difference between them. Looking at the *Sharpe-ratio* we observe that all technology funds have positive ratio with a mean of 0,13, and that the conventional funds have a mean of 0,05%. For this period, we found the largest Sharpe-ratio difference between technology and conventional funds. The technology funds mean *Treynor-ratio* for this period is 12,8%, while for the conventional funds the mean is 4,39%. We found that *Information ratio* is stable for the technology funds throughout the financial crisis, with a mean of 23,28%, while for the conventional funds the information rate mean is negative 0,67%.

Regression one- and four-factor model

A table with the results for our one-factor regression for this period can be found in the appendix under Table 11. From this table we can see that all the technology funds have positive alpha's and that the average alpha for these funds is 0,778%. Among the conventional funds half of our samples have a negative alpha, while the average alpha is 0,041%. From this we can see that the average alpha difference between technology funds and conventional funds is 0,737% in the technology funds' favor. Average beta for the technology funds registers at a mean of 1,04 through the financial crisis, with a total of four funds at beta value above one. In the same period, seven of the conventional funds register beta above one, ending up with a mean of 1,07. Adjusted R^2 in this time-period shows that conventional funds have the highest explanation ratio, with a mean of 96,39%. The technology funds have a mean of 84,19%.

Table 12 of our four-factor model shows through the financial crisis a positive alpha mean for technology funds at 0,58% and for conventional funds a mean of 0,05%. This difference of 0,53% in the technology funds' favor, makes this the time-period with the largest difference between these two groups. During the financial crisis both technology and conventional funds register R^2 -measure over 70%, with mean of 84,1% and 96,4% respectively. SMB factor for the technology funds during the financial crisis register a mean of 0,327, while for the conventional funds the SMB mean is negative 0,028. HML factors are negative in all ten technology funds. This indicates that these funds are exposed to growth companies in this time-period. The conventional funds have an average HML mean at negative 0,011, indicating that these funds are not exposed to either growth or value companies. MOM factor mean for both technology and conventional funds are close to zero with 0,001 and negative 0,005. In the market beta, there is serious changes from last period with technology funds registering a mean beta of 1,03. This is 0,04 lower than conventional mean market beta at 1,07.

4.3 After the financial crisis

Our results from table 9 in the appendix tells us that technology funds have a higher annual average return at 11,6% than conventional funds annual average return at 6,9%. It is fair to say that technology funds are still dominating the annual average return overview when the 9 top spots are filled with technology funds. DNB and Black Rock Technology occupy the first two spots at 15,2% and 14,3% respectively.

Throughout the period after the financial crisis, until the end of 2018, the *Jensen's Alpha* for the technology funds averages at 0,22%. When comparing this with conventional funds average of negative 0,15% we can see a 0,37% difference in technology funds favour. From the same table we observe *Sharpe-ratio* for the funds. Both technology and conventional funds generates a positive ratio, with a mean of 0,23 and 0,16 respectively. The highest measure of all were Red Oak Technology at 0,26 with CIBC Global Equity at the lowest ratio with 0,09. *Treynor-ratio* for this time-period shows us positive numbers for both technology and conventional funds. Technology funds register a mean of 10,37% with Lannebo Technology at the highest ratio of 13,19% and CIBC Global Equity at the lowest ratio of 4,05%. *Information ratio* after the crisis is more uneven. This time-period registers that the technology funds have mean of 9,45%, while for the conventional funds there is a negative mean of 12,91%.

Regression one- and four-factor model

Table 11 in the appendix shows our one-factor regression results from this time-period. In this overview we can see that the alpha mean for the technology funds is 0,22%. This is 0,37% higher than conventional funds negative alpha mean at 0,15%. From our results one can see that there is not much difference between the two groups' mean Beta, were technology funds mean beta was 1,09 while the conventional funds were 1,05. Adjusted R^2 for the period shows that conventional funds have the highest explanation ratio, with a mean of 89,98%, while the technology funds have a mean ratio of 68,93%.

From our four-factor model, technology funds alpha mean for this time-period is 0,23%. This is a 0,36% higher mean alpha than the conventional funds' negative mean of 0,13%, as observed from table 12 in the appendix. From the same table R^2 -measurements for technology- and conventional funds are 68,6% and 89,8% respectively. The SMB-factor for technology funds after the crisis registered a mean of negative 0,11, indicating that the technology funds are leaning towards larger companies. With the mean of 0,05 for conventional funds we can see indications of a higher exposure to smaller companies. HML-factors are positive for both the technology- and the conventional funds, with means of positive 0,05 and 0,43 respectively. This indicates that the funds are being exposed to growth companies through the time-period. Mean MOM-factors for both types of funds are negative, registering 0,021 and 0,024 respectively. This indicates that both technology- and conventional funds have a more constant

relation to momentum stocks. Through the period after the crisis, market beta of technology funds is again slightly higher than the beta for the conventional funds, with a mean of 1,09 and 1,05 respectively.

4.4 Total period

From Table 10 in the appendix we observe that historically annual return for the total time-period from August 2001 to end of 2018, are 9,7% and 7% for technology- and conventional funds respectively. In this time-period the DNB Technology fund has the highest annual return with 20,90% followed by Skagen Global at 13,11%.

The same table in the appendix shows us *Jensen's Alpha* mean for both groups of funds at 0,11% for technology funds and negative 0,04% for conventional funds. In this time-period, for both technology- and conventional funds, we observe a positive and similar *Sharpe-ratio* mean of 0,11 and 0,10 respectively. The *Treynor-ratio* for this time-period is positive for both the technology-, and the conventional funds with DNB Technology having the highest measures of all funds at 12,59%. The mean is 6,66% for the technology funds and 5,29% for the conventional funds. The *Information ratio* for the technology funds for the total period ranges from negative 6,85% for Invesco Global Technology to positive 19,39% for DNB Technology. Even if half of the technology funds registered negative ratio, the mean for the total period is positive 2,36%. The conventional funds registered a negative mean of 5,83%, ranging from positive 17,56% for Skagen Global, to negative 27,07% for CIBC Global Equity.

Regression one- and four-factor model

One-factor regression in table 11 in the appendix, shows for the technology funds a mean of 0,11% against the conventional funds' mean of negative 0,04%. Technology funds are divided 50-50% between positive and negative Alpha's, with a 1,08% difference between the lowest and the highest alpha. Among conventional funds there is only two positive Alpha's for this time-period, and the difference between the lowest and the highest alpha is 0,63%. Beta for the technology funds generates a mean of 1,23 in the total period, with all funds having a beta value above one. Eight of the conventional funds register a beta above one, and a mean of 1,06. Adjusted R^2 in this time-period shows that the conventional funds have the highest explanation ratio, with a mean of 89,98%, and that the technology funds have a mean explanation ratio of 68,93%.

Looking at Table 12 of our four-factor model for the total time-period, we observe that the technology funds' Alpha mean is 0,18%. From the same table we can see that the conventional funds' mean for the same time-period is negative 0,02%. 70% of the technology funds' Alpha's in our sample are positive. 30% of the conventional funds have positive alpha. Studying the table, we can see that technology- and conventional funds register a R^2 mean of 69,6% and 91,62% respectively. SMB-factor from technology funds register a mean of negative 0,26 and no funds have a positive value, meaning higher exposure to larger companies through the total period. The conventional funds register a mean of 0,002. The HML-factor is negative in all the technology funds with a mean of negative 0,16, while only four of the conventional funds have negative values with a mean of positive 0,02. This indicates that the technology funds are being exposed to growth companies through the total time-period, while conventional funds are leaning more towards value stocks. The MOM-factor is positive for 70% of the technology funds, registering a mean of positive 0,02 through the period. Nine out of ten of the conventional funds registered negative values, with a mean of negative 0,03. This indicates that the technology funds tend to lean towards momentum stocks through the total period, with conventional funds slightly leaning away from momentum stocks. Further, looking at the market beta through the total time-period, we observe a mean of 1,23 for technology funds, with all funds registering above 1. In the same period, conventional funds register eight out of ten with value above 1, resulting in a mean of 1,06 through the same period.

5. Discussion

From our various sets of performance measures, we observe that the conventional funds performed better than the technology funds in the first time-period. The technology funds outperforming the conventional funds in all measurements through both the second-, and third sub-periods as well as for the total time-period. Looking at the measurements in the second sub-period, during the financial crisis, the technology funds had an annual return of 13,8%, compared with an annual return of 5% for conventional funds. This makes the difference in annual return between the two groups of funds 8,8% in favor of technology funds. It may be that the technology funds are riskier than the conventional funds. However, if one considers the Sharpe and the Treynor factors, the risk is the same for the two groups of funds. This indicates that on a risk adjusted basis the technology funds yielding a significant higher return with an equivalent risk, compared to conventional funds. Same tendency appears in results from the third time-period, with the technology funds registering 4,8% higher annual return at an equivalent level of risk. Throughout the total time-period the technology funds are performing slightly better than conventional funds on all the measurements. This is confirmed by the results from both the Jensen's alpha and the Information ratio.

One-factor model

Analyzing the one-factor model by looking at the different funds separately, we saw that both the technology and the conventional funds perform unevenly throughout each period with great differentials between the best and worst funds. Looking at each type of funds combined, we see much of the same results as in the analysis above, where the first period is more dominated by conventional funds with a positive mean for the funds, resulting in a difference of 0,323% in favor of conventional funds. After this time period the technology funds are much more successful with a positive difference of 0,737% over conventional funds in the period of the financial crisis, and 0,409% for the time after the crisis. As for the total period, there is a positive difference in favor of the technology funds of 0,146%. It is worth mentioning is that a technology fund registered the highest alpha value in each of the periods, including the total- and the sub-periods. When evaluating the beta of our periods, we can see that the technology funds mainly generated in a higher beta for the entire period of 18 years, the first period, with an average beta for the technology funds of 1,61, compared to the conventional funds' average beta of 1,06. Even though the beta is almost the same for the second and the

third periods, the annual return for the technology funds is superior to the annual return for the conventional funds. This is also confirmed by the alpha results.

Four-factor model

Through the four-factor analysis, we observed that the technology funds have several negative alpha values in the first period. Thus, registering a low positive mean of 0,05%, much due to high beta from DNB Technology of 1,35% in this period. This changes within the next sub-period of the financial crisis, as well as after the financial crises, where technology funds generated more positive alpha values, where several of the conventional funds registered negative values, returning a mean difference of 0,53% and 0,36% for the respective periods in favour of the technology funds. This indicates that the technology funds performed better than the conventional funds in these periods. Looking at the total period, we may observe the effect from first sub-period, where conventional registered a slightly better alpha mean, with difference from technology funds being 0,05% in favour of conventional funds. However, due to the solid sub-periods from financial crisis until 2019, technology funds acquire a positive mean difference of 0,20% against its counterpart through the total period. Through the first sub-period we observe a lower mean difference from the four-factor model between the two types of funds than we did from the one-factor model. With technology funds generating 0,275 higher values through the four-factor model. The main reason for this is a change in alpha values for both BlackRock- and Janus H. Global Technology funds changing their value from slightly negative alpha through the one-factor model, to great positive values in the four factor model, with the change indicating that both funds perform solid in comparison to the market factors of the Fama-French four factor model. Further, observing the beta values from the four-factor model, we see differences in strategy between the two types of funds. Technology funds are mainly exposed to growth stocks through the periods, opposite from conventional funds that show tendencies towards value-stocks. Looking at the SMB-values, the technology funds have a higher exposure to large companies throughout the total period. Thus, leaning towards smaller companies throughout crisis period. Conventional funds are more indifferent, with small positive beta indicating the conventional funds focus on both smaller- and larger companies in its portfolio. Regarding momentum stocks, the values are low in both types of funds, with technology funds leaning more against momentum stocks and conventional funds with its positive values leaning the opposite direction in its investment.

6. Conclusion and recommendation

The topic of this thesis has been to analyze technology funds in comparison to conventional funds throughout the last 18 years, including both crisis and non-crisis periods. Our conclusion is drawn based on the results gathered from previous chapters, with the analysis periods being from August 2001 throughout the year of 2018, divided into four periods; the total period and three sub-periods within the total period.

The first sub-period comprises the early years of the new millennium starting with a rough period for the combined sample of our technology funds, our study found that conventional funds yielded higher risk-adjusted return and alpha, as well as lower beta values in the first period compared to the technology funds. We believe the reason for the low alpha and return and the high beta value for the technology funds being an unstable market after the burst of the dot-com bubble, when investors started again to rely on equity and actual earnings in their valuations, rather than estimated growth and potential future profit. We observed technology funds delivering better overall results than the conventional funds in the second and third periods. In addition, the technology funds performed better than the conventional funds through the total period of 18 years. Thus, the hypothesis H_1 *Risk-adjusted return from technology funds is unequal to risk-adjusted return of conventional funds* was confirmed.

The above is based on the different analysis-tools from table 7-10 in the appendix, showing that the technology funds performed significantly better than the conventional funds over time. Both the one- and the four-factor model in table 11 and 15 are showing the same tendency of significant higher alpha values for the technology funds during the last two sub-period, which are also resulting in a better alpha for the technology funds throughout the total period. We also see a change in HML throughout the whole time-period. The technology funds are being more exposed to growth companies in the first and second periods, before showing tendency of leaning towards value stocks in the third period.

Further, it is our conclusion that there is not an increase in risk from investing in technology funds compared to investing in conventional funds. This does not necessarily mean that the technology sector is risk-free, with the possibility of a “peso problem” still being present. We base this on the fact that the average return and alpha for our sample of technology funds in

this thesis have been higher than for the conventional funds through the whole period, without any notable difference in risk. As our sample of technology funds must invest minimum 75% of their assets in the technology sector market, we argue that the largest part of the returns comes from the technology sector.

The conclusion of the study we have made is that the technology funds have over the period evaluated outperformed conventional funds without taking more risk.

Recommendation

Given the possibility of a peso-problem, it could be beneficial to investigate further whether there is a possible “peso problem” associated with technology funds that has yet to be discovered by the market. In addition, there are relatively few technology funds with a long history of returns. It may be premature to go deeper into this until there is a longer history for technology funds.

Bibliography

- Bain, R. (1937). Technology and State Government. *American Sociological Review*, 2(6), 860-874. doi:10.2307/2084365
- Bill Gates quotes: words of wisdom from the Microsoft mogul. (2017, 24th May 2017). Retrieved from <https://www.telegraph.co.uk/technology/0/bill-gates-quotes-words-wisdom-microsoft-mogul/microsoft-corp-founder-bill-gates-gestures-launch-announcement/>
- Bodie, Z. (2011). *Investments and portfolio management* (9th ed., global ed. ed.). New York: McGraw-Hill/Irwin.
- Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. *Journal of Finance*, 52(1), 57-82. doi:10.1111/j.1540-6261.1997.tb03808.x
- Cave, D. (2000). Dot-com party madness. Retrieved from https://www.salon.com/2000/04/25/party_5/
- Colas, N. (2018, 6 Aug 2018). Technology stocks make up too much of the S&P 500, so the index has a fix in work. Retrieved from <https://www.cnbc.com/2018/08/06/tech-stocks-make-up-too-much-of-sp-500-but-index-has-a-fix-in-works.html>
- Comey, J. (2019, 16 March 2019). How technology is strengthening the economy but weakening our bond. Retrieved from <https://dailytimes.com.pk/365657/how-technology-is-strengthening-the-economy-but-weakening-our-bond/>
- Crabb, G. (1823). *Universal Technological Dictionary, or Familiar Explanation of the Terms Used in All Arts and Sciences*. In (pp. 524). London: Baldwin, Cradock, and Joy.
- Durbin, J., & Watson, G. S. (1951). Testing for Serial Correlation in Least Squares Regression. II. *Biometrika*, 38(1/2), 159-177. doi:10.2307/2332325
- Ferson, W. E., & Schadt, R. W. (1996). Measuring Fund Strategy and Performance in Changing Economic Conditions. *Journal of Finance*, 51(2), 425-461. doi:10.1111/j.1540-6261.1996.tb02690.x
- French, K. (2019). *Fama-french four factor model*. Retrieved from: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
- Gavious, I., & Schwartz, D. (2011). Market valuations of start-up ventures around the technology bubble. *International Small Business Journal*, 29(4), 399-415. doi:10.1177/0266242610369750
- Long, J. S., & Ervin, L. H. (2000). Using Heteroscedasticity Consistent Standard Errors in the Linear Regression Model. *The American Statistician*, 54(3), 217-224. doi:10.1080/00031305.2000.10474549
- MacKenzie, D., & Wajcman, J. (1999). Introductory essay: the social shaping of technology. In J. Wajcman & D. A. MacKenzie (Eds.), *The social shaping of technology* (2nd ed ed., pp. 3-27). Buckingham: Open University Press.
- Matias Gama, A. P. (2017). *Equity Valuation and Negative Earnings : The Case of the dot.com Bubble*. In L. C. Segura & M. A. F. Milani Filho (Eds.).
- Morningstar. (2019). Technology Sector. Retrieved from http://www.morningstar.com/InvGlossary/technology_sector.aspx
- Ramey, K. (2013). What Is Technology - Meaning of technology and its use. Retrieved from <https://www.useoftechnology.com/what-is-technology/>
- Sill, K. (2000). Understanding Asset Values: Stock Prices, Exchange Rates, And the "Peso Problem". *Business Review (Federal Reserve Bank of Philadelphia)*, 3.
- Stats, I. W. (2019). Internet Users in the World. Retrieved from <https://www.internetworldstats.com/stats.htm>

- Studenmund, A. H. (2006). *Using econometrics : a practical guide*. Boston, Mass.: Addison Wesley.
- White, H. (1980). A heteroskedasticity - consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica (pre-1986)*, 48(4), 817.
- Wolmar, C. (2007). *Fire & steam : a new history of the railways in Britain*. London: Atlantic.

Appendix

Table 6 Annual return – All periods (2001-2019)

The model includes returns from the selection of technology and conventional funds during our four time-periods.

Technology funds	Before crisis	During crisis	After crisis	Total Period
BlackRock Technology	7,44 %	14,36 %	14,27 %	11,54 %
Invesco Global Technology	-1,49 %	8,24 %	9,50 %	4,91 %
Lannebo Technology	-2,02 %	7,58 %	13,59 %	6,48 %
Janus Henderson Global Technology	5,01 %	14,14 %	8,79 %	8,01 %
Franklin Technology	6,11 %	15,07 %	13,44 %	10,72 %
Fidelity Technology	4,48 %	13,03 %	13,92 %	10,00 %
DNB Technology	25,76 %	25,67 %	15,21 %	20,90 %
Aberdeen Global Technology	3,49 %	11,96 %	7,92 %	6,70 %
Red Oak Technology	1,82 %	15,87 %	14,07 %	9,39 %
AllianzGI Technology	10,15 %	11,78 %	5,48 %	8,23 %
Conventional funds	Before crisis	During crisis	After crisis	Total Period
DNB Global	3,37 %	4,05 %	7,14 %	5,19 %
Fidelity Global Equities	6,37 %	7,04 %	7,82 %	7,13 %
Orbis Global Equity	11,42 %	11,65 %	7,91 %	9,84 %
Putnam Global Equity	4,65 %	1,06 %	7,15 %	5,30 %
SEB 1 Global	4,73 %	-1,77 %	7,91 %	5,29 %
Vanguard Global Equity	7,41 %	1,30 %	6,55 %	6,17 %
Columbia Select Global Equity	6,27 %	4,62 %	7,15 %	6,45 %
CIBC Global Equity	3,90 %	3,65 %	4,61 %	4,19 %
SKAGEN Global	23,03 %	10,32 %	5,28 %	13,11 %
Odin Global	6,61 %	8,48 %	7,04 %	7,07 %

Table 7 Analysis tools - Before crisis:*Descriptive statistics for technology and conventional funds – before crisis (Aug 2001 until Aug 2008)*

Technology fund before crisis	Annual Return	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	Information ratio
BlackRock Technology	7,44 %	6,22 %	3,32 %	-0,08 %	-1,95 %
Invesco Global Technology	-1,49 %	-5,91 %	-3,20 %	-0,77 %	-22,04 %
Lannebo Technology	-2,02 %	-5,81 %	-3,01 %	-0,90 %	-22,64 %
Janus Henderson Global Technology	5,01 %	3,08 %	1,62 %	-0,29 %	-7,39 %
Franklin Technology	6,11 %	3,72 %	2,00 %	-0,28 %	-5,47 %
Fidelity Technology	4,48 %	2,32 %	1,19 %	-0,36 %	-9,22 %
DNB Technology	25,76 %	22,28 %	11,67 %	1,27 %	21,82 %
Aberdeen Global Technology	3,49 %	1,07 %	0,57 %	-0,43 %	-10,40 %
Red Oak Technology	1,82 %	-0,69 %	-0,41 %	-0,71 %	-9,59 %
AllianzGI Technology	10,15 %	8,66 %	4,69 %	0,10 %	2,09 %
Conventional fund before crisis	Annual Return	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	Information ratio
DNB Global	3,37 %	1,72 %	0,80 %	-0,25 %	-24,29 %
Fidelity Global Equities	6,37 %	7,63 %	3,55 %	-0,04 %	-2,92 %
Orbis Global Equity	11,42 %	15,38 %	7,62 %	0,35 %	16,20 %
Putnam Global Equity	4,65 %	4,18 %	1,92 %	-0,18 %	-16,70 %
SEB 1 Global	4,73 %	4,51 %	2,06 %	-0,16 %	-17,42 %
Vanguard Global Equity	7,41 %	9,17 %	4,47 %	0,05 %	2,53 %
Columbia Select Global	6,27 %	7,69 %	3,59 %	-0,03 %	-2,67 %
CIBC Global Equity	3,90 %	3,18 %	1,44 %	-0,19 %	-23,91 %
SKAGEN Global	23,03 %	31,51 %	15,57 %	1,27 %	48,56 %
Odin Global	6,61 %	7,73 %	3,62 %	-0,03 %	-2,18 %

Table 8 Analysis tools - During crisis:*Descriptive statistics for technology and conventional funds – during crisis (Aug 2008 until end of 2010)*

Technology fund during crisis	Annual Return	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	Information ratio
BlackRock Technology	14,36 %	16,34 %	15,35 %	0,87 %	32,15 %
Invesco Global Technology	8,24 %	9,00 %	8,61 %	0,36 %	11,61 %
Lannebo Technology	7,58 %	7,30 %	6,94 %	0,26 %	7,76 %
Janus Henderson Global Technology	14,14 %	13,73 %	12,81 %	0,79 %	26,35 %
Franklin Technology	15,07 %	16,44 %	15,65 %	0,92 %	30,60 %
Fidelity Technology	13,03 %	13,19 %	12,85 %	0,73 %	20,50 %
DNB Technology	25,67 %	18,28 %	16,82 %	1,61 %	30,97 %
Aberdeen Global Technology	11,96 %	12,94 %	11,81 %	0,64 %	29,42 %
Red Oak Technology	15,87 %	15,48 %	14,95 %	0,95 %	26,50 %
AllianzGI Technology	11,78 %	12,24 %	12,21 %	0,64 %	16,98 %
Conventional fund during crisis	Annual Return	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	Information ratio
DNB Global	4,05 %	4,17 %	3,66 %	-0,03 %	-3,81 %
Fidelity Global Equities	7,04 %	7,56 %	6,70 %	0,23 %	18,63 %
Orbis Global Equity	11,65 %	12,79 %	11,62 %	0,62 %	30,58 %
Putnam Global Equity	1,06 %	0,86 %	0,76 %	-0,30 %	-22,65 %
SEB 1 Global	-1,77 %	-2,34 %	-2,10 %	-0,49 %	-27,81 %
Vanguard Global Equity	1,30 %	1,08 %	0,95 %	-0,28 %	-21,80 %
Columbia Select Global	4,62 %	5,10 %	4,50 %	0,04 %	3,76 %
CIBC Global Equity	3,65 %	3,86 %	3,38 %	-0,05 %	-7,99 %
SKAGEN Global	10,32 %	9,26 %	8,25 %	0,43 %	17,99 %
Odin Global	8,48 %	6,78 %	6,16 %	0,24 %	6,41 %

Table 9 Analysis tools - After crisis:*Descriptive statistics for technology and conventional funds – after crisis (Jan. 2011 until 2019)*

Technology fund after crisis	Annual Return	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	Information ratio
BlackRock Technology	14,27 %	23,78 %	12,61 %	0,43 %	14,39 %
Invesco Global Technology	9,50 %	19,02 %	9,53 %	0,13 %	5,89 %
Lannebo Technology	13,59 %	26,15 %	13,19 %	0,44 %	18,88 %
Janus Henderson G. Technology	8,79 %	14,12 %	7,23 %	-0,07 %	-2,29 %
Franklin Technology	13,44 %	24,02 %	12,04 %	0,37 %	14,95 %
Fidelity Technology	13,92 %	25,24 %	12,32 %	0,40 %	17,49 %
DNB Technology	15,21 %	24,98 %	12,08 %	0,43 %	16,51 %
Aberdeen Global Technology	7,92 %	16,27 %	7,62 %	-0,03 %	-1,47 %
Red Oak Technology	14,07 %	26,24 %	13,01 %	0,45 %	19,26 %
AllianzGI Technology	5,48 %	6,89 %	4,07 %	-0,40 %	-9,11 %
Conventional fund after crisis	Annual Return	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	Information ratio
DNB Global	7,14 %	14,04 %	6,02 %	-0,18 %	-19,29 %
Fidelity Global Equities	7,82 %	17,53 %	7,51 %	-0,03 %	-4,93 %
Orbis Global Equity	7,91 %	14,83 %	6,76 %	-0,11 %	-6,33 %
Putnam Global Equity	7,15 %	14,39 %	6,33 %	-0,14 %	-11,93 %
SEB 1 Global	7,91 %	21,73 %	9,80 %	0,12 %	9,09 %
Vanguard Global Equity	6,55 %	13,21 %	5,78 %	-0,19 %	-17,07 %
Columbia Select Global	7,15 %	13,54 %	6,12 %	-0,17 %	-10,46 %
CIBC Global Equity	4,61 %	9,34 %	4,05 %	-0,34 %	-35,94 %
SKAGEN Global	5,28 %	9,55 %	4,25 %	-0,35 %	-23,33 %
Odin Global	7,04 %	13,70 %	6,28 %	-0,15 %	-8,93 %

Table 10 Analysis tools - Total period:*Descriptive statistics for technology and conventional fund – total period (Aug. 2001 until 2019)*

Technology fund total period	Annual Return	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	Information ratio
BlackRock Technology	11,54 %	14,49 %	9,06 %	0,31 %	9,17 %
Invesco Global Technology	4,91 %	5,68 %	3,494 %	-0,20 %	-6,85 %
Lannebo Technology	6,48 %	7,24 %	4,39 %	-0,14 %	-4,24 %
Janus Henderson Global Technology	8,01 %	9,12 %	5,52 %	-0,03 %	-0,81 %
Franklin Technology	10,72 %	12,17 %	7,71 %	0,20 %	5,08 %
Fidelity Technology	10,00 %	12,09 %	7,30 %	0,15 %	4,68 %
DNB Technology	20,90 %	21,11 %	12,59 %	0,88 %	19,39 %
Aberdeen Global Technology	6,70 %	7,90 %	4,74 %	-0,10 %	-3,36 %
Red Oak Technology	9,39 %	9,00 %	6,17 %	0,04 %	0,83 %
AllianzGI Technology	8,23 %	8,46 %	5,65 %	-0,01 %	-0,31 %
Conventional fund total period	Annual Return	Sharpe Ratio	Treynor Ratio	Jensen's Alpha	Information ratio
DNB Global	5,19 %	7,20 %	3,80 %	-0,17 %	-17,97 %
Fidelity Global Equities	7,13 %	10,86 %	5,76 %	0,00 %	-0,22 %
Orbis Global Equity	9,84 %	14,28 %	8,01 %	0,20 %	10,09 %
Putnam Global Equity	5,30 %	7,09 %	3,77 %	-0,18 %	-15,51 %
SEB 1 Global	5,29 %	8,12 %	4,39 %	-0,11 %	-8,45 %
Vanguard Global Equity	6,17 %	8,39 %	4,53 %	-0,11 %	-7,81 %
Columbia Select Global	6,45 %	9,35 %	5,05 %	-0,06 %	-4,58 %
CIBC Global Equity	4,19 %	5,67 %	2,99 %	-0,23 %	-27,07 %
SKAGEN Global	13,11 %	17,49 %	9,70 %	0,40 %	17,56 %
Odin Global	7,07 %	8,95 %	4,92 %	-0,09 %	-4,31 %

Table 11 One-factor model – All periods (2001-2019):

This regression includes adjusted R2, Beta and Alpha values from each period, including average and differences between type of fund.

<i>Technology funds</i>	Before crisis (Aug 2001-Aug 2008)			During crisis (Aug 2008 throughout 2010)			After crisis (Jan 2011 throughout 2018)			Total period (Aug 2001 throughout 2018)		
	Alpha (α)	Beta (β)	Adjusted R2	Alpha (α)	Beta (β)	Adjusted R2	Alpha (α)	Beta (β)	Adjusted R2	Alpha (α)	Beta (β)	Adjusted R2
BlackRock Technology	-0,08 %	1,449	69,10 %	0,87 %	0,920	86,08 %	0,43 %	1,10	62,37 %	0,31 %	1,134	68,12 %
Invesco G. Technology	-0,77 %	1,283	66,95 %	0,36 %	0,929	82,80 %	0,13 %	0,96	70,01 %	-0,20 %	1,046	70,39 %
Lannebo vision	-0,90 %	1,545	73,57 %	0,26 %	1,057	83,96 %	0,44 %	1,00	69,04 %	-0,14 %	1,190	72,34 %
Janus H. Technology	-0,29 %	1,475	71,03 %	0,79 %	1,085	87,29 %	-0,07 %	1,17	66,89 %	-0,03 %	1,225	72,74 %
Red Oak Technology	-0,71 %	1,945	54,61 %	0,95 %	1,046	81,25 %	0,45 %	1,05	71,49 %	0,04 %	1,318	56,52 %
AllianzGI Technology	0,10 %	1,604	67,07 %	0,64 %	0,945	76,00 %	-0,40 %	1,26	50,18 %	-0,01 %	1,234	59,57 %
Franklin Technology	-0,28 %	1,741	67,87 %	0,92 %	0,948	83,73 %	0,37 %	1,09	69,95 %	0,20 %	1,227	66,33 %
Fidelity G. Technology	-0,36 %	1,561	75,09 %	0,73 %	0,996	79,74 %	0,40 %	1,10	73,82 %	0,15 %	1,198	73,06 %
DNB Technology	1,27 %	1,983	71,89 %	1,61 %	1,512	89,79 %	0,43 %	1,23	75,18 %	0,88 %	1,561	74,98 %
Aberdeen G Technology	-0,43 %	1,517	70,05 %	0,64 %	0,992	91,27 %	-0,03 %	0,99	80,36 %	-0,10 %	1,149	74,09 %
<i>Conventional funds</i>	Before crisis (Aug 2001-Aug 2008)			During crisis (Aug 2008 throughout 2010)			After crisis (Jan 2011 throughout 2018)			Total period (Aug 2001 throughout 2018)		
	Alpha (α)	Beta (β)	Adjusted R2	Alpha (α)	Beta (β)	Adjusted R2	Alpha (α)	Beta (β)	Adjusted R2	Alpha (α)	Beta (β)	Adjusted R2
Putnam Global Equity	-0,18 %	1,054	93,18 %	-0,30 %	1,088	97,90 %	-0,14 %	1,07	91,15 %	-0,18 %	1,073	94,44 %
Orbis Global Equity	0,35 %	1,155	80,41 %	0,62 %	0,982	92,27 %	-0,11 %	1,12	84,68 %	0,20 %	1,072	84,90 %
DNB Global	-0,25 %	0,939	92,40 %	-0,03 %	1,040	98,97 %	-0,18 %	1,12	95,87 %	-0,17 %	1,036	95,73 %
Fidelity Global Equities	-0,04 %	1,053	91,27 %	0,23 %	1,015	97,29 %	-0,03 %	0,99	96,16 %	0,00 %	1,019	94,94 %
SEB 1 Global	-0,16 %	1,019	94,33 %	-0,49 %	0,954	94,03 %	0,12 %	0,77	86,63 %	-0,11 %	0,918	91,34 %
Vanguard Global Equity	0,05 %	1,072	83,19 %	-0,28 %	1,107	98,31 %	-0,19 %	1,07	92,10 %	-0,11 %	1,085	91,62 %
Columbia Global Equity	-0,03 %	1,017	91,02 %	0,04 %	0,974	97,88 %	-0,17 %	1,11	86,22 %	-0,06 %	1,027	91,29 %
CIBC Global Equity	-0,19 %	0,887	96,13 %	-0,05 %	1,009	99,16 %	-0,34 %	1,05	93,96 %	-0,23 %	0,985	96,15 %
Odin Global	-0,03 %	1,101	89,99 %	0,24 %	1,337	92,07 %	-0,15 %	1,06	83,96 %	-0,09 %	1,182	88,51 %
SKAGEN Global	1,27 %	1,311	80,92 %	0,43 %	1,222	96,05 %	-0,35 %	1,16	89,02 %	0,40 %	1,222	86,65 %

Average alpha before crisis

Technology fund	-0,244 %
Conventional fund	0,080 %
Difference	-0,323 %

Average alpha during crisis

Technology fund	0,778 %
Conventional fund	0,041 %
Difference	0,737 %

Average alpha after crisis

Technology fund	0,215 %
Conventional fund	-0,154 %
Difference	0,369 %

Average alpha total period

Technology fund	0,111 %
Conventional fund	-0,036 %
Difference	0,146 %

Table 12 Four-factor model – Before crisis

The following table include Carhart's four-factor model from the time-period Aug 2001 until Aug 2008. Including adjusted R2, Beta and Alpha values, as well as average and differences between type of fund.

<i>Technology funds before crisis</i>	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
BlackRock Technology	0,27 %	1,404	-0,448	-0,490	0,103	70,9 %
Invesco Global Technology	-0,77 %	1,289	-0,208	0,019	0,057	66,2 %
Lannebo Technology	-0,62 %	1,516	-0,277	-0,775	0,328	77,2 %
Janus Henderson Global Technology	0,02 %	1,441	-0,650	-0,432	0,170	74,6 %
Red Oak Technology	-0,30 %	1,908	-0,995	-0,864	0,462	59,3 %
AllianzGI Technology	0,55 %	1,543	-0,474	-0,692	0,135	69,4 %
Franklin Technology	0,24 %	1,675	-0,680	-0,917	0,277	72,6 %
Fidelity Technology	-0,11 %	1,533	-0,441	-0,483	0,198	77,1 %
DNB Technology	1,35 %	1,985	-0,265	-0,498	0,347	73,0 %
Aberdeen Global Technology	-0,11 %	1,478	-0,338	-0,614	0,190	71,8 %
<i>Conventional funds before crisis</i>	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
Putnam Global Equity	-0,19 %	1,052	0,030	0,115	-0,083	93,5 %
Orbis Global Equity	0,50 %	1,128	-0,049	-0,033	-0,122	80,8 %
DNB Global	-0,25 %	0,938	-0,039	0,118	-0,066	92,6 %
Fidelity Global Equities	0,07 %	1,037	-0,149	0,004	-0,069	91,9 %
SEB 1 Global	-0,24 %	1,033	-0,018	0,136	0,001	94,4 %
Vanguard Global Equity	-0,07 %	1,089	0,023	0,277	-0,070	83,5 %
Columbia Select Global Equity	0,05 %	1,005	-0,118	-0,080	-0,001	91,1 %
CIBC Global Equity	-0,20 %	0,889	-0,043	0,098	-0,040	96,3 %
Odin Global	-0,09 %	1,105	0,049	0,266	-0,140	91,2 %
SKAGEN Global	1,40 %	1,283	0,100	0,052	-0,209	82,1 %
	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
Technology funds	0,05 %	1,577	-0,478	-0,574	0,227	71,23 %
Conventional funds	0,10 %	1,056	-0,021	0,095	-0,080	89,74 %
Difference	-0,05 %	0,521	-0,456	-0,670	0,306	-18,51 %

Table 13 Four-factor model – During crisis

The following table include Carhart's four-factor model from the time-period Aug 2008 throughout 2010. Including adjusted R2, Beta and Alpha values, as well as average and differences between type of fund.)

<i>Technology funds during crisis</i>	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
BlackRock Technology	0,66 %	0,906	0,345	-0,319	-0,003	86,3 %
Invesco Global Technology	0,15 %	0,913	0,323	-0,500	0,021	84,1 %
Lannebo Technology	0,00 %	1,042	0,421	-0,184	-0,030	83,1 %
Janus Henderson Global Technology	0,77 %	1,086	0,096	-0,207	0,058	86,4 %
Red Oak Technology	0,64 %	1,029	0,535	-0,332	-0,005	81,2 %
AllianzGI Technology	0,38 %	0,922	0,337	-0,223	-0,083	74,3 %
Franklin Technology	0,76 %	0,938	0,302	-0,398	0,046	84,3 %
Fidelity Technology	0,66 %	0,999	0,254	-0,252	0,093	78,9 %
DNB Technology	1,43 %	1,491	0,185	-0,152	-0,090	88,9 %
Aberdeen Global Technology	0,36 %	0,974	0,474	-0,425	0,005	93,4 %
<i>Conventional funds during crisis</i>	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
Putnam Global Equity	-0,44 %	1,086	0,282	0,071	-0,010	98,1 %
Orbis Global Equity	0,72 %	0,970	-0,364	0,035	-0,110	92,7 %
DNB Global	0,00 %	1,044	-0,018	0,031	0,017	98,9 %
Fidelity Global Equities	0,15 %	1,005	0,074	-0,154	-0,030	97,2 %
SEB 1 Global	-0,35 %	0,971	-0,136	0,281	0,040	94,2 %
Vanguard Global Equity	-0,34 %	1,104	0,087	0,049	-0,021	98,2 %
Columbia Select Global Equity	-0,01 %	0,968	0,065	-0,173	0,003	98,0 %
CIBC Global Equity	-0,05 %	1,008	-0,015	-0,068	0,008	99,1 %
Odin Global	0,48 %	1,361	-0,235	0,027	0,136	92,0 %
SKAGEN Global	0,34 %	1,201	-0,019	-0,213	-0,088	96,0 %
	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
Technology funds	0,58 %	1,030	0,327	-0,299	0,001	84,09 %
Conventional funds	0,05 %	1,072	-0,028	-0,011	-0,005	96,43 %
Difference	0,53 %	-0,042	0,355	-0,288	0,007	-12,34 %

Table 14 Four-factor model – After crisis

The following table include Carhart's four-factor model from the time-period Jan 2011 throughout 2018. Including adjusted R2, Beta and Alpha values, as well as average and differences between type of fund.

<i>Technology funds after crisis</i>	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
BlackRock Technology	0,50 %	1,099	0,017	-0,067	-0,133	61,5 %
Invesco Global Technology	0,12 %	0,946	0,012	0,159	0,072	69,4 %
Lannebo Technology	0,51 %	0,996	0,078	-0,052	-0,115	68,4 %
Janus Henderson Global Technology	-0,09 %	1,154	-0,037	0,162	0,081	66,1 %
Red Oak Technology	0,40 %	1,040	-0,294	0,267	0,104	72,3 %
AllianzGI Technology	-0,35 %	1,220	0,116	0,317	0,042	49,2 %
Franklin Technology	0,41 %	1,084	-0,241	-0,010	-0,129	69,9 %
Fidelity Technology	0,37 %	1,108	-0,308	0,021	-0,003	73,8 %
DNB Technology	0,43 %	1,221	-0,189	0,091	-0,030	74,8 %
Aberdeen Global Technology	-0,02 %	1,003	-0,208	-0,107	-0,095	80,5 %
<i>Conventional funds after crisis</i>	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
Putnam Global Equity	-0,11 %	1,067	-0,005	0,003	-0,055	91,0 %
Orbis Global Equity	-0,09 %	1,111	0,105	0,010	0,000	84,3 %
DNB Global	-0,15 %	1,118	0,019	0,011	-0,047	95,8 %
Fidelity Global Equities	0,00 %	0,981	0,082	0,065	-0,011	96,2 %
SEB 1 Global	0,10 %	0,769	0,082	0,023	0,056	86,5 %
Vanguard Global Equity	-0,18 %	1,061	-0,012	0,077	0,003	92,0 %
Columbia Select Global Equity	-0,15 %	1,104	0,054	0,019	-0,015	85,8 %
CIBC Global Equity	-0,33 %	1,047	0,065	0,002	0,001	93,8 %
Odin Global	-0,11 %	1,068	0,002	-0,110	-0,104	83,8 %
SKAGEN Global	-0,29 %	1,141	0,094	0,056	-0,072	89,0 %
	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
Technology funds	0,23 %	1,087	-0,105	0,078	-0,021	68,59 %
Conventional mutual funds	-0,13 %	1,047	0,049	0,016	-0,024	89,82 %
Difference	0,36 %	0,040	-0,154	0,063	0,004	-21,23 %

Table 15 Four-factor model – Total period (2001-2019).

The following table include Carhart's four-factor model from the total time-period Aug 2001 until 2019. Including adjusted R2, Beta and Alpha values, as well as average and differences between type of fund.)

<i>Fund total period</i>	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
BlackRock Technology	0,41 %	1,127	-0,208	-0,279	-0,038	68,7 %
Invesco Global Technology	-0,18 %	1,049	-0,088	-0,153	0,027	70,3 %
Lannebo Technology	-0,07 %	1,189	-0,107	-0,342	0,019	73,1 %
Janus Henderson Global Technology	0,03 %	1,229	-0,353	-0,180	0,038	73,5 %
Red Oak Technology	0,14 %	1,327	-0,586	-0,350	0,078	58,3 %
AllianzGI Technology	0,06 %	1,226	-0,172	-0,140	-0,050	59,3 %
Franklin Technology	0,32 %	1,225	-0,433	-0,413	0,009	68,3 %
Fidelity Technology	0,21 %	1,203	-0,330	-0,262	0,052	74,1 %
DNB Technology	0,90 %	1,566	-0,131	-0,123	0,041	74,8 %
Aberdeen Global Technology	-0,01 %	1,145	-0,187	-0,362	-0,001	75,2 %
<i>Conventional Fund total period</i>	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
Putnam Global Equity	-0,17 %	1,067	0,045	0,037	-0,047	94,5 %
Orbis Global Equity	0,25 %	1,059	-0,031	-0,005	-0,093	85,1 %
DNB Global	-0,17 %	1,033	-0,014	0,060	-0,024	95,8 %
Fidelity Global Equities	0,04 %	1,012	-0,047	-0,046	-0,049	95,1 %
SEB 1 Global	-0,12 %	0,922	-0,039	0,031	0,023	91,3 %
Vanguard Global Equity	-0,13 %	1,083	0,024	0,118	-0,019	91,7 %
Columbia Select Global Equity	-0,05 %	1,027	-0,029	-0,030	-0,004	91,2 %
CIBC Global Equity	-0,23 %	0,984	0,012	0,030	-0,004	96,1 %
Odin Global	-0,08 %	1,180	-0,011	-0,012	-0,013	88,3 %
SKAGEN Global	0,44 %	1,206	0,109	0,011	-0,116	87,1 %
	Alpha (α)	β1 (Rm - Rf)	β2 (SMB)	β3 (HML)	β4 (MOM)	Adjusted R2
Technology funds	0,18 %	1,229	-0,259	-0,260	0,018	69,57 %
Conventional funds	-0,02 %	1,057	0,002	0,019	-0,034	91,62 %
Difference	0,20 %	0,171	-0,261	-0,280	0,052	-22,06 %

Table 16 Correlation technology funds – Sub-periods (2001-2019).

Table includes correlation of technology funds through each of our sub-periods, with total period shown in table 2.

Correlation before crisis Technology	BRT	IGT	LT	JHT	FRT	FT	DT	AGT	ROT	AGT
BlackRock Technology	1,00									
Invesco Global Technology	0,89	1,00								
Lannebo Technology	0,87	0,83	1,00							
Janus Henderson Global Technology	0,96	0,92	0,90	1,00						
Franklin Technology	0,95	0,90	0,90	0,97	1,00					
Fidelity Technology	0,94	0,92	0,93	0,95	0,96	1,00				
DNB Technology	0,83	0,83	0,87	0,84	0,85	0,88	1,00			
Aberdeen Global Technology	0,93	0,92	0,90	0,93	0,95	0,95	0,86	1,00		
Red Oak Technology	0,91	0,85	0,83	0,91	0,95	0,91	0,81	0,93	1,00	
AllianzGI Technology	0,95	0,89	0,90	0,94	0,94	0,94	0,86	0,92	0,89	1,00
Correlation during crisis Technology	BRT	IGT	LT	JHT	FRT	FT	DT	AGT	ROT	AGT
BlackRock Technology	1,00									
Invesco Global Technology	0,98	1,00								
Lannebo Technology	0,93	0,93	1,00							
Janus Henderson Global Technology	0,96	0,96	0,94	1,00						
Franklin Technology	0,99	0,98	0,93	0,97	1,00					
Fidelity Technology	0,96	0,97	0,95	0,96	0,96	1,00				
DNB Technology	0,91	0,90	0,95	0,95	0,90	0,91	1,00			
Aberdeen Global Technology	0,97	0,96	0,95	0,96	0,96	0,96	0,94	1,00		
Red Oak Technology	0,97	0,95	0,92	0,97	0,97	0,95	0,91	0,95	1,00	
AllianzGI Technology	0,95	0,93	0,92	0,92	0,95	0,92	0,86	0,93	0,93	1,00
Correlation after crisis Technology	BRT	IGT	LT	JHT	FRT	FT	DT	AGT	ROT	AGT
BlackRock Technology	1,00									
Invesco Global Technology	0,89	1,00								
Lannebo Technology	0,82	0,88	1,00							
Janus Henderson Global Technology	0,84	0,84	0,74	1,00						
Franklin Technology	0,95	0,92	0,85	0,86	1,00					
Fidelity Technology	0,84	0,91	0,87	0,82	0,89	1,00				
DNB Technology	0,81	0,85	0,86	0,77	0,85	0,89	1,00			
Aberdeen Global Technology	0,84	0,92	0,85	0,83	0,89	0,89	0,86	1,00		
Red Oak Technology	0,87	0,90	0,83	0,87	0,90	0,89	0,85	0,88	1,00	
AllianzGI Technology	0,84	0,78	0,69	0,91	0,81	0,72	0,70	0,73	0,83	1,00

Table 17 Correlation conventional funds – Sub-periods (2001-2019).

Table includes correlation of conventional funds through each of our sub-periods, with total period shown in table 3.

Correlation before crisis Conventional	<i>SG</i>	<i>DG</i>	<i>FGE</i>	<i>OGE</i>	<i>PGE</i>	<i>S1G</i>	<i>VGE</i>	<i>OG</i>	<i>CGE</i>	<i>CSGE</i>
SKAGEN Global	1,00									
DNB Global	0,88	1,00								
Fidelity Global Equities	0,91	0,95	1,00							
Orbis Global Equity	0,90	0,87	0,87	1,00						
Putnam Global Equity	0,90	0,95	0,94	0,86	1,00					
SEB 1 Global	0,88	0,95	0,95	0,85	0,95	1,00				
Vanguard Global Equity	0,89	0,85	0,88	0,87	0,92	0,88	1,00			
Odin Global	0,91	0,92	0,91	0,88	0,93	0,93	0,88	1,00		
CIBC Global Equity	0,91	0,95	0,94	0,90	0,94	0,95	0,91	0,95	1,00	
Columbia Select Global Equity	0,91	0,94	0,95	0,87	0,95	0,93	0,89	0,90	0,93	1,00
Correlation during crisis Conventional	<i>SG</i>	<i>DG</i>	<i>FGE</i>	<i>OGE</i>	<i>PGE</i>	<i>S1G</i>	<i>VGE</i>	<i>OG</i>	<i>CGE</i>	<i>CSGE</i>
SKAGEN Global	1,00									
DNB Global	0,98	1,00								
Fidelity Global Equities	0,98	0,98	1,00							
Orbis Global Equity	0,96	0,96	0,94	1,00						
Putnam Global Equity	0,98	0,98	0,98	0,96	1,00					
SEB 1 Global	0,96	0,97	0,96	0,94	0,95	1,00				
Vanguard Global Equity	0,97	0,98	0,99	0,95	0,98	0,97	1,00			
Odin Global	0,96	0,96	0,96	0,94	0,94	0,98	0,96	1,00		
CIBC Global Equity	0,98	0,99	0,98	0,96	0,98	0,97	0,99	0,96	1,00	
Columbia Select Global Equity	0,98	0,99	0,98	0,94	0,99	0,95	0,98	0,94	0,99	1,00
Correlation after crisis Conventional	<i>SG</i>	<i>DG</i>	<i>FGE</i>	<i>OGE</i>	<i>PGE</i>	<i>S1G</i>	<i>VGE</i>	<i>OG</i>	<i>CGE</i>	<i>CSGE</i>
SKAGEN Global	1,00									
DNB Global	0,94	1,00								
Fidelity Global Equities	0,94	0,96	1,00							
Orbis Global Equity	0,89	0,92	0,92	1,00						
Putnam Global Equity	0,92	0,93	0,96	0,89	1,00					
SEB 1 Global	0,86	0,91	0,89	0,84	0,85	1,00				
Vanguard Global Equity	0,91	0,93	0,96	0,88	0,96	0,87	1,00			
Odin Global	0,92	0,89	0,91	0,84	0,90	0,85	0,88	1,00		
CIBC Global Equity	0,93	0,94	0,96	0,89	0,94	0,89	0,95	0,92	1,00	
Columbia Select Global Equity	0,88	0,89	0,94	0,83	0,93	0,83	0,96	0,88	0,93	1,00

Table 19 Covariance conventional funds – All periods (2001-2019).

Table includes covariances of conventional funds through each of our four time-periods.

<i>Covariance Total period Conventional</i>	<i>SG</i>	<i>DG</i>	<i>FGE</i>	<i>OGE</i>	<i>PGE</i>	<i>S1G</i>	<i>VGE</i>	<i>OG</i>	<i>CGE</i>	<i>CSGE</i>
SKAGEN Global	0,003									
DNB Global	0,002	0,002								
Fidelity Global Equities	0,002	0,002	0,002							
Orbis Global Equity	0,003	0,002	0,002	0,003						
Putnam Global Equity	0,002	0,002	0,002	0,002	0,002					
SEB 1 Global	0,002	0,002	0,002	0,002	0,002	0,002				
Vanguard Global Equity	0,003	0,002	0,002	0,002	0,002	0,002	0,002			
Odin Global	0,003	0,002	0,002	0,002	0,002	0,002	0,002	0,003		
CIBC Global Equity	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	
Columbia Global Equity	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002
<i>Covariance before crisis Conventional</i>	<i>SG</i>	<i>DG</i>	<i>FGE</i>	<i>OGE</i>	<i>PGE</i>	<i>S1G</i>	<i>VGE</i>	<i>OG</i>	<i>CGE</i>	<i>CSGE</i>
SKAGEN Global	0,003									
DNB Global	0,002	0,001								
Fidelity Global Equities	0,002	0,001	0,002							
Orbis Global Equity	0,002	0,001	0,002	0,002						
Putnam Global Equity	0,002	0,001	0,002	0,002	0,002					
SEB 1 Global	0,002	0,001	0,002	0,002	0,001	0,002				
Vanguard Global Equity	0,002	0,001	0,002	0,002	0,002	0,001	0,002			
Odin Global	0,002	0,001	0,002	0,002	0,002	0,002	0,002	0,002		
CIBC Global Equity	0,002	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	
Columbia Global Equity	0,002	0,001	0,002	0,002	0,002	0,001	0,002	0,002	0,001	0,002
<i>Covariance during crisis Conventional</i>	<i>SG</i>	<i>DG</i>	<i>FGE</i>	<i>OGE</i>	<i>PGE</i>	<i>S1G</i>	<i>VGE</i>	<i>OG</i>	<i>CGE</i>	<i>CSGE</i>
SKAGEN Global	0,008									
DNB Global	0,007	0,006								
Fidelity Global Equities	0,007	0,006	0,006							
Orbis Global Equity	0,006	0,005	0,005	0,006						
Putnam Global Equity	0,007	0,006	0,006	0,006	0,006					
SEB 1 Global	0,006	0,005	0,005	0,005	0,005	0,005				
Vanguard Global Equity	0,007	0,006	0,006	0,006	0,006	0,006	0,007			
Odin Global	0,009	0,007	0,007	0,007	0,008	0,007	0,008	0,010		
CIBC Global Equity	0,007	0,006	0,005	0,005	0,006	0,005	0,006	0,007	0,005	
Columbia Global Equity	0,006	0,005	0,005	0,005	0,006	0,005	0,006	0,007	0,005	0,005
<i>Covariance after crisis Conventional</i>	<i>SG</i>	<i>DG</i>	<i>FGE</i>	<i>OGE</i>	<i>PGE</i>	<i>S1G</i>	<i>VGE</i>	<i>OG</i>	<i>CGE</i>	<i>CSGE</i>
SKAGEN Global	0,002									
DNB Global	0,002	0,002								
Fidelity Global Equities	0,001	0,001	0,001							
Orbis Global Equity	0,002	0,002	0,001	0,002						
Putnam Global Equity	0,002	0,001	0,001	0,001	0,002					
SEB 1 Global	0,001	0,001	0,001	0,001	0,001	0,001				
Vanguard Global Equity	0,002	0,001	0,001	0,001	0,001	0,001	0,002			
Odin Global	0,002	0,001	0,001	0,001	0,001	0,001	0,001	0,002		
CIBC Global Equity	0,002	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	
Columbia Select Global Equity	0,002	0,001	0,001	0,001	0,002	0,001	0,002	0,001	0,001	0,002