Investment Project v5.5

An investigation of investment options for a hands-off, international investor looking for long-term, high-return investments.

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Tuesday 13th February, 2024

Executive Summary

This report is produced for an international investor operating out of Australia, who is seeking recommendations for long-term, hands-off, high-performing securities. The report begins with a comprehensive overview of available investment options, and following a chain of logical arguments, ultimately recommends 5 mutual funds and 3 exchange traded funds for long-term investment. Both these recommendations and the methodology used produce them are based directly on the preferences of the client, and as such, may require modification to suit investors with different preferences. The report is structured as follows.

Chapter 1 provides an overview of the most popular basic investment options, including term deposits, commodities, stocks, bonds, property, annuities, mutual funds, and ETFs. By looking at their benefits and limitations, with a focus on potential risks and historical returns, stocks, mutual funds, and ETFs are identified as the securities that align most closely with the client's preferences. Ultimately, investing in individual stocks is not recommended to the client for multiple reasons. Primarily, investment in individual companies is highly risky compared to relatively diversified investments in mutual or exchange-traded funds. In addition to this, maintaining a stock portfolio requires ongoing attention, which goes against the client's requirement for a portfolio that can be maintained on no more than a quarterly basis. Ultimately, Chapter 1 concludes that mutual funds and ETFs are most appropriate for the client, due to their potential for high returns, relative diversification, and low requirement for maintenance.

Looking specifically at mutual funds, accumulation funds are determined to be more appropriate for the client when compared to distribution funds. This is because accumulation funds confer a tax advantage in that their growth is considered a capital gain, as opposed to the income from a distribution fund. Later in Chapter 1, the fee structures offered by mutual fund providers are investigated, and specific fund classes such as I and Y are identified as the most desirable for long-term investment due to their lower fees. This information is used in Chapter 4 to make recommendations for specific mutual fund classes.

Having concluded that mutual funds and ETFs are the most suitable investment option for the client, Chapter 2 looks at various markets that operate around the world, and investigates their history of risk (volatility) and returns by looking at relevant stock market indices. This chapter ultimately concludes that markets in the USA have been the strongest performers over the past 30 years. This is in comparison to markets like Europe, which has not grown at a competitive rate, and China, which has grown at a similar rate overall, but has seen significantly more volatility, and is therefore considerably more risky. Chapter 2 compares market sectors like technology, mining, and healthcare, ultimately concluding that the fastest growing sector has been technology, which is especially true in the US, where the Nasdaq index is the highest global performer. Ultimately, combining the information in this chapter with what was determined in Chapter 1 suggests that fund-type investments in the technology sector will be most appropriate for the client.

With the goal of finding a broker to facilitate investment in these funds, Chapter 3 investigates the brokers that offer mutual funds to Australian investors. To determine the best broker for the client, a scoring system is proposed based on existing research by BrokerChooser. The system in this report considers the same 9 attributes that BrokerChooser does in their research, but recalculates certain scores to more closely represent the preferences of the client. The attributes considered for each broker include fees, trading platforms, the

available markets and products, customer service, and safety, among others.

Ultimately the broker selection process concludes that Swissquote is the most appropriate broker for the client. This is because they offer an exceptional level of security, a large selection of mutual funds, and a competitive fee structure for fund investments in particular. Other competitive options include Interactive Brokers and Vanguard, which also offer an excellent range of fund investments and high quality platforms, but have considerably less to offer in the way of safety.

The report concludes with Chapter 4, in which a process is detailed for making explicit mutual fund and ETF recommendations for the client's portfolio. For this, Morningstar is identified as the most valuable source of fund data due to the large selection of funds in its database, and the leading amount of readily accessible information provided about each fund. The fund selection process begins by establishing some minimum requirements for investable funds based on the results of the previous chapters. The first requirement, as concluded in Chapter 1, is that only accumulation funds are eligible. Secondly, a performance threshold is established based on the historical performance of the global indices that were investigated in Chapter 2. This threshold is set at 12.9% for ETFs (equal to the annualised performance of the Nasdaq over the last 10 years), and 14% for mutual funds to account for the additional risk conferred by active management. Finally, funds are required to have a minimum initial investment of no more than 1.5 million USD.

The mutual funds and ETFs that meet these preliminary selection criteria are identified, and 48 attributes describing the features and historical performance of each fund are harvested from Morningstar. These funds then proceed through an automatic scoring process to shortlist the best candidates for investment. The automatic process generates 23 individual scores for each fund, based on these 48 attributes including the fund's size, inception date, historical return, Morningstar Rating, ongoing charge, Analyst Rating, and 3 year alpha, among others. These scores are then weighted relative to each other to prioritise the attributes which are most relevant to the preferences of the client.

These weights were optimised in an iterative manner until the score contributions for the 24 attributes were suitably balanced. A manual process was then undertaken to review attributes that were considered too nuanced for automatic selection. Uninvestable fund classes were removed at this point, and only the most desirable class and currency combination of each fund was retained. To produce the final list of recommendations, the highest performing funds in the scoring process were investigated, and the best performers were added to the list as long as their primary holdings didn't significantly overlap with another fund higher on the list. This ensures that a diverse set of sectors (e.g. technology, healthcare) and geographies are represented.

Resulting from multiple iterations of the scoring and selection process, the top 5 mutual funds recommended for the client's portfolio are:

1. Fidelity Funds - Global Technology Fund,
2. Legal & General Global Technology Index Trust,
3. UBS (Lux) Equity SICAV - USA Growth,
4. CT (Lux) - Global Technology,
5. BlackRock Global Funds - World Technology Fund.

The top 3 exchange-traded funds are:

1. iShares Core S&P 500 UCITS ETF USD,
2. Xtrackers MSCI World Information Technology UCITS ETF,
3. iShares NASDAQ 100 UCITS ETF USD.

The automatic scoring program is also provided as a method for regenerating recommendations and evaluating existing investments in future years.

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Chapter 1

Investment Options

This chapter investigates the basic investment options available to a relatively inexperienced investor. A brief overview of each option will be given, and the benefits and limitations of each are presented. In particular the expected returns, risk, and volatility of each investment option are discussed, and the level of capital guarantee that is provided is also investigated.

The section begins with the simplest and most common investment options, and generally increases in complexity throughout the chapter.

1.1 Basic Investment Options

1.1.1 On Call Cash

Holding cash or depositing into a savings account that can be accessed without restriction. Savings accounts will offer a low, most often variable, interest rate in exchange for this flexibility with access. They also offer very low or no fees – these fees can however be a flat rate, which may be equal to or greater than the amount of interest earned on small amounts of money. It is also possible to get bonus interest on savings accounts and other extra features such as easily linked transaction accounts.

Return In Australia, savings accounts offer a range of interest rates between 0.0–3.8% p.a. (January 2023). Bonus interest rates may take some accounts above this when certain conditions (usually minimum deposit amounts) are met. Fees on these accounts are negligible but overall the returns are low relative to most other investment types.

Volatility From a domestic perspective, cash is not volatile as it's value cannot change relative to itself, however from a global standpoint the value of cash depends closely on the value of the currency held compared to the value of other currencies globally, which can change due to many political and economic factors. Interest rates on savings accounts do also fluctuate, often related to changes in CPI.

Capital Guarantee Cash is capital guaranteed as the amount of dollars in a bank account will not decrease over a time period (excluding fees).

Risk Risks of cash are very low as savings accounts in major banks in many countries are government guaranteed in case the bank holding your money goes bankrupt. The chance of this also seems relatively low. In Australia the government guarantees a maximum of 250,000 AUD per person, per 'Authorised Deposit-taking Institution' (ADI), however some ADI's operate multiple brands and thus money held over multiple brands may still only be eligible for the maximum 250,000 AUD guarantee.

1.1.2 Term Deposits

A low risk investment strategy where you give money to a financial institution for a fixed period of time and earn a fixed interest rate on it over that period. Commonly offered terms are 3, 6 or 12 months and 3, 5 or even 10 years. The money cannot be accessed during the term without penalty. The fixed interest rate makes term deposits predictable, however this can be either positive or negative depending on the performance of the market. As with cash in savings accounts, term deposits can usually be made with very low/no fees unless the money needs to be recovered before the end of the fixed term. If the money must be accessed before the end of the term the deposit may even return no interest.

Return Term deposit rates are relatively low. At the time of writing (January 2023), Australian term deposits have annual interest rates of up to 4.5% and as low as 0.1% p.a.. They usually offer higher rates over longer terms, which is true in the current economic climate, however in a declining global market returns on long-term deposits may return less than shorter terms. The rate of return on term deposits in Australia is closely linked with predictions for the future "cash rate", published by the Reserve Bank.

Volatility Term deposits have little volatility as the interest rate is agreed upon before the term begins. Over time the interest rates offered on new term deposits may change by small percentages but there is no risk of the interest rate changing during the term and hence these are an extremely predictable investment. The volatility of rates offered on new term deposits depends on the prediction for the performance of the economy and can also change as an incentive for customers to put their money into the deposit for a time period that is desirable for the financial institution.

Liquidity Term deposits are relatively illiquid until maturity of the term, and the increased costs faced when withdrawing before maturity make this an economically bad idea.

Capital Guarantee Term deposits are capital guaranteed assuming they are held until maturity, early withdrawal from a term deposit may result in a loss in some circumstances. This assumes the financial institution doesn't default on the payment.

Risk As with on-call cash there is only a tiny risk of losing your money as the government guarantee safeguards against a complete loss during bankruptcy of the institution similar to cash. The main risk is that unforeseen circumstances will result in needing to withdraw the money before maturity of the term. There is often a month-long waiting period before the bank will give you access to the money after you decide to end the term they will also often charge fees, and decrease the interest rate disproportionate to the amount of time that has elapsed of the term. In some cases no interest is paid.

1.1.3 Commodities

There are a variety of ways to invest in commodities, including simply purchasing an amount of the physical item such as precious metals. The types of commodities available also include food, fuel, many metals and raw agricultural materials.

Gold Gold deserves a special mention as a commodity, as the price of gold – contrary to most other commodities – changes in a counter-cyclical fashion to investments like stocks. This is because, in periods of market turmoil investors purchase gold as a 'safe haven' for their money. This increased demand then drives up gold's value when the price of stocks falls.

Return Relative to other investment styles, commodities can offer a low-medium level of return. In the years between 1992 and 2022, the average return on the commodity price index at `https://www.indexmundi.com/commodities/` was 7.6%, however this is biased significantly upward by the data from 2020–2022. Over this period the commodity index has increased in value by over 40% p.a., and between 1992 and 2019 the rate is only 3.1%.

Volatility Commodities have a relatively high volatility. Volatility of commodities depends heavily on the product being invested in, the price of crops such as soybean often falls after a year's harvest as the increase in supply drives down the price. These can be some of the most volatile assets. Other commodities like precious metals are comparatively less volatile as the supply is relatively constant and predictable, however demand shocks are still able to significantly alter the price of these commodities.

Liquidity Most common commodities are regarded as liquid assets. Liquidity depends on the size of the holding you are trying to sell vs. trade volume of the given commodity on any given day. For commodities like gold where one may actually be in possession of the commodity they simply have to sell it to someone to liquidate, the same is effectively true for other forms of investment in commodities. Generally the amount of any commodity held will be insignificant compared to the daily trade volume and thus commodities can usually be sold quickly without altering the market price.

Capital Guarantee Commodities are not capital guaranteed as their value – similar to stocks – depends on supply and demand.

Risk Commodities are naturally risky investment as the value of the commodity is dependant only on the supply and demand of the product. Agricultural products for example, have risks associated with extreme weather events and thus investments in individual commodities is relatively dangerous.

1.1.4 Stocks

A share of ownership – usually of a publicly listed company – whose value depends on the willingness to buy and sell shares of the company by other investors as traded on an open market. The stock price is then what buyers are willing to pay for a single share. A company usually sells a fixed amount of shares however it is possible to create more, diluting the value of existing shares. Some of the profits from the organisation are distributed equally among shareholders proportional to the amount of stock held as *dividends*.

Stocks can also be categorised as *defensive* or *cyclical* depending on the magnitude of their change in value compared to the performance of the economy as a whole. Stocks in luxury goods that people may avoid purchasing during economic hardship are usually cyclical as the company will make less profit in poorly performing markets, however necessities like water and gas will still be purchased and thus these are more defensive stocks.

Stocks may also be either *distribution* or *accumulation* stocks.

Distribution stocks tend to reliably pay a proportion of their profits to shareholders as dividends, these are usually mature businesses, they do this because they don't expect to see any rapid growth in the company's value.

Accumulation stocks on the other hand tend not to pay dividends and instead, if they make profits, they reinvest profits back into the company to increase its value and help with rapid growth to capture market share. This results in greater willingness to buy the stock by investors and hence stock held can be sold for an increased value. This type of sale is how investors in growth stocks collect their profits.

Return Stocks exist in a very diverse range of companies over many industries (technology, energy, agriculture, etc.) where different industries often have quite different associated returns, volatility and risk depending on the type of market (geographic or sector) as well as many other factors. The S&P 500 index has returned just under 10.7% p.a. between December 2012 and December 2022 (before adjusting for average inflation of 1.9% p.a. over the same period). The best investors may see returns almost double this – e.g. Warren Buffet, who has seen consistent returns of ∼20% over his 60 years of investment.

Volatility Stocks are relatively volatile compared to other investment types. In 2007–2008 – for example – stock markets fell between 40–50% over only a 2 month period. In addition there have been many smaller market declines, of between 10 and 20 percent, in subsequent years.

Liquidity Liquidity of a stock depends on how much of that stock is being bought/sold at a given time – the trade volume – compared to how much you are trying to sell. Generally the most purchased stocks are easily liquidated as the trade volume is high. Since stocks are traded by the second, most stocks can usually be liquidated in minutes when markets are open.

Capital Guarantee Investments in stocks are not capital guaranteed as the value of an investment may increase or decrease over any time period.

Risk Investment in stocks is considered risky due to relatively high volatility and the lack of capital guarantee. The value of stock is also directly linked to the performance of financial markets as a whole, hence fluctuations like bubbles and crashes have the potential to result in significant capital gains or losses.

The volatility of investment in individual stocks can be mitigated through diversification over a range of stock holdings, however such an investment is still subject to fluctuations in overall market performance. Investment in counter-cyclical assets is a further step that can be taken to reduce this market risk at the cost of some growth during periods of market success.

1.1.5 Bonds

A contractual agreement between a bond issuer (such as a government or business) and an investor where the investor provides funds to the bond issuer for an agreed fixed period of time, at the end of which the bond issuer agreed to bay back the principal amount. In addition the bond issuer agrees to pay interest on the loan for the duration of the term. The interest rate an investor can expect depends on the perceived risk of lending money to the institution. For example, US Treasury bonds (issued by the US government) are considered quite secure, and their 1 year treasury bond offers an interest rate of 4.6% in 2022. Note that this is significantly above the long-term average of 2.9%.

Less secure countries may offer treasury bonds at rates more like 8% and bonds that involve loaning the money for a greater period of time will (ignoring external economic factors) also usually confer a higher return as it is harder to predict the future of the organisation over the extended period of time.

Bonds tend to pay interest semi-annually (though not always), then at maturity the principal will be paid back. They are usually offered for a term of 1, 3, 5 or 10 years but there is no restriction on the term and bonds for periods of 30 years (for example) can be found.

As well as purchasing bonds directly from governments or companies, one can invest in bonds by trading on the secondary bond market, where bond owners who believe it is the best course of action to sell the bond trade it for money, effectively cashing out early. Bonds may be sold for a low price on the secondary market if the bond no longer seems like a valuable investment and the opposite is true for high sale prices. Even the secondary bond market tends to be less volatile than the market for stocks. In the last 3 decades the worst year for the US bond market saw only a 3% fall over the year. Purchasing bonds in combination with other investments (diversifying) can also be beneficial as the value of bonds on the secondary market often moves opposite to stocks.

Return At the time of writing, Investment Grade bonds (rated by a credit rating agency as BBB-[1] or better) tend to return between 2.5% and 5.5% interest p.a. paid periodically, then the principal is paid back at maturity. *Junk bonds* (rated below BBB-) tend to return between above 6% depending on their quality but have a significantly higher associated risk. These figures, especially for Investment Grade bonds, are higher in 2022 than they have been for many years due to global economic factors.

Volatility Bonds are comparatively less volatile than stocks as more is known about the return that can be expected on the bond before purchase. Bonds are considered to be counter-cyclical to stocks, as during poor stock market performance existing bonds will still be performing at their agreed upon rate, thus there is higher demand for them on the secondary market and so secondary market prices will increase.

Liquidity Bonds are generally considered to be illiquid as they operate on a basis similar to term deposits. It is possible to liquidate a bond through sale on a secondary bond market, however this often results in less income than would be seen by taking the bond to maturity, and a loss in capital value. It is usually only considered if liquidation is required before the bond matures.

Capital Guarantee Bonds are capital guaranteed on the primary market assuming that the bond is held until maturity. Trading bonds on the secondary market is not capital guaranteed as it depends on the willingness of other investors to purchase your bond, this fluctuates depending on the relative returns of other available investment options.

Risk While bonds are not inherently volatile, and are capital guaranteed on the primary market, it is important to consider the opportunity cost of a bond investment. If a bond is purchased with a low interest rate while investment options are poor, market conditions are likely to improve in the future. When this happens, other more profitable investment options become available and it will be costly to switch if you have invested in low-yield bonds. This is because bonds are relatively illiquid, and sale on the secondary market under these conditions would be at a considerable loss. This illiquidity (and lack of capital guarantee on the secondary market) is also a risk if the bond needs to be sold to access the money for any other reason.

There is also credit risk associated mostly with bonds from companies, this is where the company cannot afford to make the interest or principal repayments when they are due. Thus it is important to ensure the bond is with a credit worthy organisation *or* you are compensated for this risk with a large interest rate.

1.1.6 Property

Investment properties are purchased with the intention of receiving a positive return on the cost of the property either through rental income, resale of the property at a higher price, or both.

Principal Residences A principal residence is the house you live in for a majority of your time. Governments around the world have different criteria for what qualifies as a principal or main residence. Principal residences can be considered investments if they are purchased with the goal of resale at a higher price in future through appreciation of value. This form of investment in a principal residence is popular since, as well as having a

[1] "Bond Credit Ratings" are issued by credit rating agencies to assess the likelihood of a debt being repaid. The S&P rating scale ranges from AAA to D, where BBB- is the lowest "Investment Grade" rating. `https://en.wikipedia.org/wiki/Bond_credit_rating`

house to live in, sale of principal residences is usually exempt from capital gains tax, meaning the profit made on its sale is not taxed at the rate you would be taxed for profits on sales of stocks, bonds, other property investments, etc.

Commercial Property Property rented out specifically for business purposes such as commercially owned office buildings or retail locations. Often earning higher rent than residential property due to its purpose for business. Improvement and maintenance on commercial property can be more expensive than residential properties since they are often larger in scale and tenants are less flexible as they often cannot operate their business during significant property improvement or maintenance. Profits made from the sale of commercial property are subject to capital gains tax which is charged at an individual's marginal tax rate.

Residential Property Apartments or houses rented out to tenants who pay regular rent, similar to commercial property. Again similarly, residential property can earn money from rent as well as resale at a greater price than purchased for. Maintenance and improvements are not as costly due to the smaller scale of residential property, however the amount of rent received from leasing residential property on a small scale is not so large. Profits made from the sale of residential property are also subject to capital gains tax.

Negative Gearing When making a property investment, one can borrow money from a financial institution to afford a more expensive property than would be possible with their initial capital.

By taking a loan the investor will suffer increased costs due to interest payments they owe, reducing the day-to-day profit from rental income. However, assuming the property bought with the loan will appreciate in value at the same percentage rate, the investor will see significantly increased capital gains upon sale of the property purchased with the loan.

A hypothetical example of this follows, start by assuming that;

- You have \$100,000 to invest in property,
- You will be investing for 10 years,
- Inflation averages 3% per annum over this period,
- Any purchased property appreciates at 5% p.a. in real terms,
- Rental returns are 5% the value of the property p.a.,
- Maintenance costs are 1% p.a.,
- Any loans are taken as interest only at a rate of 5% p.a.

Option 1

The first option available is to purchase a small property costing \$100,000. In this scenario, the annual cash flow is 4% (5% rent returns minus 1% maintenance), and the annual capital gain is 8% (5% real appreciation plus 3% CPI) for a total of 12% per annum. In this scenario both the annual cash flow and capital gain are subject to tax at the investor's marginal rate.

At the end of the 10 years, the property is then worth $\$100,000 \times 1.08^{10} \approx \$216,000$ and the investor has received \$40,000 in rental income for a total income before tax of \$156,000 ($\$216,000 - \$100,000 + \$40,000$).

Option 2

The second option then, is to take out a \$400,000 loan and purchase a \$500,000 property. In this scenario there is no net annual cash flow (5% rent returns minus 1% maintenance minus $0.8 \times 5\% = 4\%$ loan repayment). The annual capital gain is still 8%.

This time, the value of the property after 10 years is $\$500,000 \times 1.08^{10} \approx \$1,080,000$ and there is no positive or negative cash flow. The \$400,000 loan must then be repaid, leaving $\$1,080,000 - \$400,000 = \$680,000$ profit before tax.

Importantly, if the investor's annual cash flow had been made negative by a higher interest rate on the loan (or other expenses), then the annual negative cash flow could be deducted from their taxable income each year, generating further benefit. This is the process of negative gearing.

It is clear from this example that option 2 has the potential to generate significantly larger profits (\$680k vs. \$156k), however the process of negative gearing adds another risk, as depreciation in the value of the property

may result in the investor losing a portion of the amount they invested and still having to repay the bank, seeing small or negative profits for themselves.

Return Property in Australia has appreciated on average at a rate of 6.0% p.a. between 2012–2022, with this figure again being inflated by the 2020–2022 period. These are capital gains that are realised upon sale of the property. Property in prime locations increases in value at a higher rate than this though, and the median house price in Melbourne has appreciated by 6.4% p.a. since 2011. Based on the way these percentages are calculated however (using selling price minus buying price), the numbers necessarily include any investments made by the owner into improvements or renovations, and in extreme cases, a complete knockdown and rebuild. Figures for the cost of this are difficult to find, but the most credible estimates place the cost of such improvements at approximately 1.2% of the value of the property per annum. Property can also be highly volatile, and in 2007–08 the average property in Australian cities fell by 6.2% in the space of 6 months.

The average return from *rent* on residential property in Australia in 2010–15 was 3.6% per year, whereas commercial property had an average gross rental yield of 8–10% of the cost of the property per year. The cost of selling a property can also reduce the returns considerably, as this can be between 2 and 4 percent, with some agents charging greater fixed marketing costs in exchange for a lower commission. This can be an enormous cost on a high valued commercial or residential property investment and needs to be factored into the return calculations. The longer an investment is held, the lower the effect will be of the entry and exit costs on the annual return due to amortisation.

Volatility Property is comparatively less volatile than shares but more volatile than an investment such as bonds, as the value of a property usually depends on the development of the surrounding area, the economic climate (interest rates) and supply vs. demand. However property prices can fall from year to year.

Liquidity Property is relatively illiquid as selling a property can be costly and time consuming. The entire property must usually be sold as you can't just sell the kitchen to access a portion of your property investment.

Capital Guarantee Property is not capital guaranteed. Prices generally rise, but can also decrease in value for economic reasons such as supply and demand. Damage or maintenance may also result in negative profit from a property investment over a period of time.

Risk Whilst property is comparatively less volatile than many other investment types, investing in commercial or residential property relies on having people pay to use the property in order to make profits, thus you run the risk of the property being vacant for an extended period of time with these options.

Properties may also depreciate in value due to a variety of reasons, consumer trends in the style of the property or its location as well as the age of structures on the property and their remaining life expectancy can all contribute to this. Property can also be challenging and expensive to liquidate, which is especially true if the property is currently not performing well or predicted to lose value in the future. Another risk of property is that – as a tangible asset – it is vulnerable to damage, which can sometimes cost large proportions of the value of the property. This can be mitigated somewhat through taking out insurance, however this introduces additional costs. Similarly there are unavoidable costs associated with property maintenance.

Buying and selling property is also very expensive compared to other investments as expenses such as stamp duty, legal fees and real estate fees contribute to this cost. Thus having to sell a property early can result in serious losses. Negative gearing on property introduces further risk as a percentage change in the value of the property will result in a disproportionately large change in the amount of money that will be retained or lost upon sale, and although capital is not guaranteed in a property investment, negative gearing amplifies this risk.

1.1.7 Annuities

An investor can buy an annuity from an annuity provider with a lump sum payment or by paying smaller amounts over an accumulation phase. The provider will then contract with the purchaser to pay them an amount – usually monthly – until the end of life (which may occur sooner or later than anticipated). Upon death the provider keeps the payment made by the investor. Annuities can be purchased individually or joined with a spouse, in a joint arrangement payments will continue until both holders die.

Annuities can either be **fixed** or **indexed**, where fixed annuities will pay a set amount for the duration of the annuitization phase and indexed arrangements will pay an increased amount according to increases in CPI, such that the real value of the payment made remains constant throughout the persons life. Annuity payments are usually given as a percentage of the amount paid for the annuity and the size of payments will depend on

factors like age, the choice of individual or joint and fixed or indexed arrangements as well as other factors that may impact the life expectancy of the investor (smoking status, medical history etc.).

Return A study by Advantage Compendium found that the average annual return of annuities was 3.3%, with a maximum 5.5% and minimum 1.2%. Similar results were found when independently calculating annuity payments for a variety of health/age/extras combinations.

Volatility Annuities are extremely predictable and have relatively low volatility.

Liquidity Annuities are usually illiquid, there is often a short period in which a person can change their mind about the annuity and refund the principal but after this date there is no chance to reclaim the principal investment.

Capital Guarantee A predetermined and guaranteed amount can be expected to be paid for the duration of the annuity and thus – although it is not guaranteed that the capital amount will be fully paid out – there is an element of guarantee to investment in annuities.

Risk While annuities have low volatility and are capital guaranteed there are other risks. A risk exclusive to annuities that don't increase payouts according to inflation is that rapid inflation causes the real value of annuity payouts to become less valuable in real terms more quickly than anticipated.

There is also the risk of death occurring earlier than expected, resulting in less payout than what was invested. Finally, there is the risk associated with the company that the annuity is held in, if the company bankrupts then they cannot continue to pay the annuity, however annuities in most countries are guaranteed such that you will be paid out up to a certain amount if this occurs. Investing over a range of annuity companies further decreases the risk as this could be claimed from each.

1.2 Managed Funds

In this section, the term Managed Funds will be used to refer to Mutual Funds and Exchange Traded Funds (ETFs) collectively, encompassing both active and passively managed varieties (as defined in Section 1.2.1 below). It will explore the various managed investment options available, their similarities and differences, as well as the historical returns, risk, and volatility.

1.2.1 Mutual Funds

A mutual fund is a legal entity where a group of investors pool money together and a manager invests the funds according to a defined **prospectus** (a statement of intent of the managers focus on geography, industry, market capitalisation and security type) in hopes of beating the market indices after subtracting the management fees and costs. Their choice of investments that follow this prospectus is known as their portfolio and may contain any securities discussed in Section 1.1, but most commonly stocks and bonds.

Mutual funds are popular since the fund managers are professionals who will have increased skills in forecasting the markets and can hence offer larger returns than a layperson investor. It is also a simple way to diversify while only purchasing a single security, as mutual funds typically invest in a range of companies and industries.

Investors benefit from investment in mutual funds in one of two ways, either:

- **Increasing Net Asset Value (NAV)** where the manager calculates the value of the mutual fund on a daily basis and presents this value as the NAV. This can go up or down on a daily basis but generally trends upwards over time.
- **Income Payments** where, to the extent that any securities earn income over time (dividend payments, fixed interest returns, etc.) the manager either pays the investor that income on a periodic basis (distribution fund) or includes those incomes in the daily NAV calculation (accumulation fund). Distribution funds are sometimes referred to by managers using `Dist`, or as income funds (`Inc`), and likewise, accumulation funds are sometimes referred to as growth funds.

Various types of mutual funds exist along a spectrum from completely passive to highly active management. In general, actively managed mutual funds involve a management team selecting, monitoring and changing the investment portfolio on a regular basis with the aim of selecting only the best performing securities (stocks and/or bonds etc.) in the hope of achieving above market returns even after subtracting their own costs of management and charges.

Typical costs of management for actively managed mutual funds are in the range of 0.7% per annum to as high as 2.5% per annum. This means that a management team for an actively managed mutual fund must beat the market by between 0.7% and 2.5% per annum in order to justify their contribution to the investment.

History has shown that around 90% of active managers do not add sufficient additional return to cover their costs and so, increasingly, investors are moving away from active management to a more passive investment model.

In a passive mutual fund a small management team will select a set of securities – often based on an index, which are updated infrequently. This decreases management costs, but reduces the ability for the mutual fund to capitalise on the dynamic nature of the market.

Subsections 1.2.2 and beyond will introduce Exchange Traded Funds (ETFs) and Trackers, which are both closely related to mutual funds. Table 1.1 shows some of the areas in which these varieties differ. Note that individual mutual funds and ETFs cannot be both active and passive, but instead it is possible to be one or the other.

Table 1.1: A Comparison of Mutual Funds, ETFs, and Trackers.

	Active	**Passive**	**Stock Exchange Traded**	**Liquidity**
ETFs	✓	✓	✓	Very High
Mutual Funds	✓	✓	✗	High
Trackers	✗	✓	✓	Very High

1.2.1.1 Mutual Fund Classes

As mentioned above, fees and fee structures vary significantly between mutual funds. On top of this, individual mutual funds often offer multiple *classes* which are differentiated by their fee structure and minimum initial purchase requirements even though the underlying securities are shared between classes. Older classes typically have larger fees, which have been pushed down by market forces over time as the demand for lower cost mutual funds has increased. In spite of this, these older classes remain open in many cases, and because of this it is important to understand the fee structures offered by the different class varieties in order to select the lowest cost and best performing investment class. This section will detail many of the common mutual fund classes and look at the fee structures and initial investment hurdles of the classes which are defined consistently by most mutual fund providers.

Before continuing it is worth summarising the various fee types and their typical and extreme ranges.

Front-end Load An initial charge paid on purchase of a mutual fund and deducted from the initial investment. Front-end loads are paid to the broker as compensation for finding clients and enabling sale of the fund. In some mutual funds the front-end load can be as high as 5–6%, though it is more common to see charges in the 0–4% range with most modern funds offering a class with 0 front-end load for retail investors.

Deferred Load A percentage fee charged upon redemption of mutual fund shares and paid to the fund provider. The percentage may be fixed, or may reduce over time, eventually dropping off to zero. Deferred loads are implemented to disincentivise short-term trading of mutual funds. A reducing deferred load may start out as large as 5 or 6%, but decrease over time, and fixed deferred loads are usually closer to 1–2%.

12b-1 Fee This is fee that exists for mutual funds listed on US exchanges. It is an annual marketing or distribution fee on a mutual fund, limited at 1% annually by the Securities and Exchange Commission. Today, most mutual funds use the 12b-1 fee to reward brokers for selling shares of the fund, though historically it was believed that using the fee for marketing would benefit investors in the fund over the long-term.

Annual Management / Operational Fee An annual charge levied by the investment manager for managing a mutual fund. The management fee is used to compensate managers for their time and expertise in managing the portfolio and also covers the administration costs of the fund and the manager's profit. These fees can range from as low as 0.1% up to and occasionally above 2% p.a. The reason for the large range of annual management fees is that at the low end we are talking about largely passively managed mutual funds whilst at the high end we

are looking at mutual funds that include fees to cover the manager's costs and profits plus an annual fee paid to the financial advisor or broker as a reward for introducing the client. The annual fee paid to the broker or financial advisor can, in itself, be in the range of 0.5 to 1.4% and so is a very significant contributor to the overall cost of owning these mutual funds.

Performance Fee A payment made to an investment manager only when they generate positive returns throughout the year. The fee is usually calculated as a percentage of the investment profits throughout the year, and is often between 10 and 20% of these profits. A performance fee is supposed to align the incentive of the managers with that of the investors in the mutual fund, and may have a hurdle percentage greater than zero so that, for example, the manager has to earn above the fund's benchmark index in order to receive a performance payment. Performance fees are unpopular because many investors see that an annual bonus does not align with most investor's long term perspectives and that performance fees can be triggered by pure market volatility events or extreme contrarian positions which can reduce long-term returns.

Having considered the main types of fees above, the following paragraphs summarise the popular and common fund classes.

Class A Mutual Funds are an expensive share class that uninformed investors are directed towards by financial advisors and brokers because it gives the introducing party both an upfront and annual fee. They have a low or non-existent minimum investment, and typically have a Front-end Load of up to 5.8%. The maximum Deferred Load (paid on sale) is 0%, and the ongoing 12b-1 Fees can be up to 0.5%. The mutual fund manager will charge an Annual Management Fee (usually 0.1–2%) on top of this, though this is not defined by the fund class.

Class B Mutual Funds similarly to class A, have low or no minimum initial investment, but instead of charging a Front-end Load, charge a Deferred Load on sale. B-class mutual funds have existed for a long time, and therefore often have large, outdated fee levels. There is typically no Front-end Load, and a Deferred Load of up to 5%. The Annual Management Fee is usually in the 0.1–2% range, and the 12b-1 Fee tends to be larger than with class A, at between 0.8 and 1%. In addition to this, investors in B-class mutual funds may have to agree to a minimum investment period, and will be subject to additional fees if they need to redeem their shares before this date. Although the fees can be quite large on Class B funds, if the Deferred Load decreases over time these can end up being quite acceptable for long-term investors.

Class C Mutual Funds usually also have low minimum initial investments. They don't usually have a Front-end Load, but occasionally up to 1%, and their Deferred Load can also be up to 1%. They charge a larger Annual Management Fee, usually around 1% more than class A or B funds, and have a 12b-1 Fee of between 0.8 and 1%. The Annual Management Fee again varies between mutual funds and based on how active the management strategy is, though it is again usually in the 0.1–2% range.

Class F Mutual Funds operate under somewhat of a different fee structure to other classes. They tend not to charge a Front-end or Deferred Load, and have Annual Management fees of approximately 1% less than other mutual fund classes (0–1%). F class funds do, however, charge an additional fee which is not present for other classes. The F, standing for 'Fee-Based' indicates that an investor in an F-class mutual fund will pay a percentage fee based on the size of their investment, where a 1.5% fee may apply to the first $500,000, a 1.25% fee on the second $500,000, etc. The actual percentage fees and investment size brackets are free to vary between funds.

Class I, Y, or Institutional Mutual Funds are typically purchased by large institutional investors. These institutional investors are looking for low fee structures but can offer to purchase large amounts of the fund in return. To meet this need, managers offer Class I/Y mutual funds with low fees but often requiring large initial (and sometimes ongoing) purchases. They do not, however, require an investor to demonstrate an institutional structure, meaning they are purchasable as long as the minimum investment hurdle can be met. It is common for Institutional classes to have minimum investment amounts greater than 1 million USD, and usually above $25,000, but sometimes as low as $1–2,000, or even zero. They do not typically charge a Front-end or Deferred Load. The 12b-1 Fee is also usually 0%, meaning that the Management Fees are typically the only expense. These are often in the same 0.1–2% range as other classes, but are lower for institutional classes on average.

Class R, K, or J Mutual Funds are made available through retirement plans and are typically not available to individual investors. They typically have no Front-end or Deferred load, but the ongoing Management Fees

vary widely and sometimes include administrative costs associated with running the retirement plan. When this is the case, Annual Management Fees can be in the 1–4% range. The maximum 12b-1 Fee is 0.5%.

Class S or Z Mutual Funds have been closed to new investors and were usually formerly available to employees of the fund provider with no Front-end, Deferred, or 12b-1 Fees.

Class X Mutual Funds are not usually purchasable by retail investors and are subject with an alternative fee structure where the shareholder is invoiced directly by the fund managers. This class is usually only available to employees of the fund provider and their associates.

Summary of Mutual Fund Classes. Looking at fee structures of all the common classes, the institutional class (I and Y) funds tend to offer the lowest fees that are accessible to retail investors. Unfortunately the large initial investment required for these classes can be prohibitive for many investors. In this case, classes such as B could be considered for long term investments if the Deferred Load is acceptable or reduces to zero over time.

It should be understood that Class A mutual funds are generally to be avoided due to their high fees and the significant commission paid to the broker/financial advisor. Finally, before buying any class, it is worth checking to see if the selected broker offers any superior classes.

These may not be publicised by the broker, but could still be available on request.

1.2.2 Exchange Traded Funds (ETFs)

Exchange Traded Funds, similar to mutual funds, hold a group of securities, and can be either actively or passively managed, though the latter is far more common. They are typically based on a benchmark, and passively managed ETFs tend not to deviate from it. Actively managed ETFs, however, have a management team making decisions to deviate from the benchmark to capitalise on fluctuations in the market. Generally even actively managed ETFs will remain fairly faithful to their benchmark, but the managers are free to change sector allocations, make continuous trades, or deviate from the benchmark as they see fit.

1.2.2.1 Comparison to Mutual Funds

As mentioned above, the core structure of mutual funds and ETFs are relatively similar, as both are collections of securities which can be purchased and sold as a single entity. Similar to most mutual funds, ETFs track a benchmark such as an index, sector, or commodity and can also choose to distribute or reinvest (accumulate) profits.

The primary difference between the mutual funds and ETFs is that ETFs are listed as a tradable entity on a stock exchange and can generally be bought and sold in real-time while markets are open, whereas mutual funds are traded once daily. ETFs also differ in terms of the investor's ownership over the underlying assets of the fund. Where investors in a mutual fund have ownership over a share of the assets that the fund holds, this is not true for ETFs.

Instead, an investor in an ETF owns a share in the ETF which does not actually represent ownership of the underlying assets. This is due to the way ETFs are established and the involvement of Authorised Participants, which is discussed further in Section 1.2.2.2. The lack of ownership over the underlying assets allows for additional financial engineering in the creation of ETFs and is why it is possible to create synthetic ETFs, which are discussed in more detail in Section 1.2.2.4.

A further difference, which influences the risk profile of ETFs in comparison to mutual funds, is that ETFs tend to be less diversified. This is because the overwhelming majority of ETFs are designed to track a specific index, sector, or commodity, and since they tend not to deviate from their index, they have very limited exposure to other areas of the market. This extreme focus makes ETFs much more susceptible to crashes in the sectors that they track, and the fact that many ETFs are comprised of high percentages of individual assets means that periods of economic decline can affect ETFs significantly more than mutual funds.

1.2.2.2 Operation of ETFs

Compared to mutual funds, a significantly more complex series of events occurs during the creation and maintenance of an ETF. To understand the process it is worth first defining some key terms:

Sponsor A manager or prospective manager of an ETF.

Authorised Participant (AP) An organization which is authorised to create and redeem shares of an ETF. Typically APs are large banks.

ETF Creation The process begins with a sponsor filing a plan to create an ETF with a government agency; in the US this is the Securities and Exchange Commission. After approval, the sponsor makes an agreement with an Authorised Participant, noting that sometimes the sponsor and the AP are the same entity. In a traditional ETF arrangement, the AP acquires the assets that the ETF is designed to track and places these in a trust with the sponsor.

Creation units are then formed from the assets in the trust, which are bundles of 10,000–600,000 (usually 50,000) shares in the ETF that represent actual ownership over the underlying securities. These creation units are given to the AP to be sold to brokers, and the individual shares that comprise the creation units are subsequently resold to investors. Note that the shares sold to investors no longer represent ownership of the underlying assets in the trust.

ETF Maintenance Since the amount of shares in an ETF does not change frequently, significant fluctuations in demand can cause shares of the ETF to trade either above or below the actual NAV of the assets held in the trust. In the case where there is a shortage of ETF shares in the market the price of individual shares can be expected to increase. If the market price goes above the price of the underlying securities, then the ETF is said to be trading at a *premium*, and it is the responsibility of the AP to purchase more of the underlying assets, create new creation units, and sell these to brokers to be sold to investors. Conversely, when the market price falls below the NAV of the underlying assets, the ETF is said to be trading at a *discount*, and, as mentioned in the section above, it is in the interest of the AP to redeem shares of the ETF to realign the prices.

ETF Redemption Investors can sell their holdings in an ETF in one of two ways. Retail investors typically sell shares in an ETF on the open market, which requires no action from the trust or AP. The second option, which is generally only used by institutional investors, is to acquire enough shares of the ETF to form a creation unit, then exchange this creation unit for the underlying securities in the trust. When this happens, the creation unit is destroyed and the securities are turned over to the redeemer.

This redemption of an entire creation unit is usually performed when the ETF is trading at a discount, as the redeemer can acquire the shares at the discounted price and exchange them for a proportionally greater amount of stock. Additionally, the nature of this exchange (being a trade of ETF shares for securities) confers a tax advantage for the redeemer in comparison to selling the shares on the market. This is because the trade does not involve any cash payment, and is therefore not subject to any capital gains tax.

1.2.2.3 Types of ETFs

It's possible to categorise most ETFs into one of 4 broad categories, though not all ETFs conform to these labels. The major categories are:

Diversified Passive Equity ETFs which account for most of the largest ETFs. These passively managed ETFs are designed to mirror the performance of the largest and most widely followed stock market indices, and as the name suggests, tend to be more diversified than other varieties of ETF. ETFs in this category would track indices such as the S&P 500 or Dow Jones Industrial Average.

Niche Passive Equity ETFs are similar to the previous category in that they are also passively managed equity funds. ETFs in this category are labelled niche since they often track a subset of major indices, with examples including funds that track the smallest 100 companies in the Russel 2000, or S&P 500.

Active Equity ETFs include any funds making equity investments similar to the above categories, but which have active managers making decisions to deviate from their benchmark indices. These generally exist for major indices, and are less common for more niche sectors.

Fixed Income ETFs are different to equity ETFs and focus on bonds rather than stocks. They are generally actively managed and designed around a more stable portfolio which distributes profits to shareholders, though this is not always the case.

In addition to these major categories, many other varieties of ETFs exist, which provide access to even more niche or emerging markets. One of the most popular and rapidly growing classes of ETF is the currency or cryptocurrency ETF.

Currency / Cryptocurrency ETFs are simply designed to track a currency or basket of currencies, or cryptocurrency or basket of cryptocurrencies respectively. They are becoming especially popular for investment in cryptocurrency since the process of investing in cryptocurrencies can be complicated and unfamiliar for many investors, and the ETF structure allows for simple diversification over a basket of currencies or cryptocurrencies.

1.2.2.4 Synthetic ETFs

From the perspective of the investor, synthetic ETFs appear extremely similar to a traditional ETF structure. Both can be created to track the same types of assets, and should provide the same returns, but there is additional flexibility and risk associated with the composition of a synthetic ETF. In a synthetic ETF the sponsor (ETF provider) purchases a basket of securities, and makes a swap agreement with a *counterparty*. Under this agreement the counterparty receives the return that is generated by the basket of securities purchased by the sponsor. In return the counterparty promises to pay the return of the benchmark that the ETF is designed to track. This is then paid to the investors in the ETF.

The synthetic structure is especially useful in gaining exposure to small or inaccessible markets, since neither party needs to own shares in the benchmark assets. It does however expose investors in the ETF to additional risk in the form of *counterparty risk*. This is simply the risk that the counterparty cannot honour their promise to swap the agreed upon return of the benchmark assets.

Synthetic trackers can be found for almost all major indices, as well as for specific sectors or commodities. The *Lyxor FTSE China A50*, for example, tracks the 50 largest Chinese A-rated shares, providing exposure to a specific subset of the Chinese market without any party actually having to place investment in Chinese companies directly.

1.2.2.5 Other ETF Varieties

ETFs of all the above types can also be modified in additional ways.

Inverse ETFs hold short positions, a short position will allow an investor to benefit from a drop in the price of an index or basket of securities. An inverse ETF will usually include -1x (or potentially a value other than 1) in their name.

Leveraged ETFs take an investor's money, and use that asset to borrow further monies to provide investors with a multiplier on the return of the benchmark index. A 2x leveraged ETF on the S&P 500 – for example – would provide 2% return when the S&P 500 returned 1% on any given day, the same being true in the opposite direction when prices fall. This significantly increases potential return, the risk, and the potential for losses, and means that even when the benchmark index falls and recovers completely, the leveraged ETF may still be at a loss. The mechanism behind this is explained in the example below.

A 2 times leveraged ETF will typically include (2x) in its name, similarly for other amounts of leverage. Note that it is possible to have Inverse ETFs which are also leveraged, combining their naming conventions.

One might expect that the performance of 2x a leveraged ETF on a $1000 investment would be identical to the return achieved by taking out a $1000 loan and investing the loaned money plus an additional $1000 into a 1x leveraged ETF, but this is not the case for periods longer than a single day. This is because leveraged ETFs undergo *daily rebalancing* to avoid the possibility of a negative NAV.

Rebalancing occurs at the end of each day and involves the ETF selling equity to pay off debt, or taking additional debt to purchase more equity. The ETF does this so that the ratio of debt to equity is consistent with the amount of leverage that the ETF offers. Below is an exaggerated example comparing the performance of a 2x leveraged ETF with the return achieved by taking individual debt to purchase twice the amount of an unleveraged ETF.

In this example UL will refer to an unleveraged ETF, while L will refer to a leveraged ETF, where both ETFs are assumed to perfectly mirror an underlying index at their leverage ratio. Two investors wish to make a $1000 investment, and the investor in the unleveraged ETF is assumed to have access to a $1000 loan with no interest. Similarly the leveraged ETF is assumed to not incur costs upon rebalancing.

Initialisation - UL: Investor 1 takes out a $1000 loan and invests $2000 into the 1x ETF. Net position: +$1000.

Initialisation - L: Investor 2 invests $1000 into the 2x leveraged ETF. The ETF provider (in effect) takes on an additional $1000 of debt and purchases $2000 of securities. Net position: +$1000.

Day 1: The index falls 10%.

Day 1 - UL: Investor 1 suffers a loss of \$200, they now hold \$1800 of equity and \$1000 of debt. Net position: +\$800.

Day 1 - L: The leveraged ETF suffers the same loss and also holds \$1800 equity and \$1000 debt. The ETF then rebalances, selling \$200 of equity to pay off \$200 of debt. The ETF now holds \$800 of debt and \$1600 of equity, for the same net position of +\$800.

Day 2: The index falls a further 10%.

Day 2: UL: Investor 1 suffers a further \$180 loss. They hold \$1620 of equity and \$1000 of debt. Net position: +\$620.

Day 2: L The equity in the leveraged ETF falls from \$1600 to \$1440, then the ETF rebalances by selling \$160 of its equity to pay off debts. The ETF now holds \$1280 in equity and \$640 of debt for a net position of +\$640. Note that on Day 2 the investor in the leveraged ETF lost less money due to the rebalancing process.

Day 3: The index rises $1 - \frac{1}{0.81} \approx 23.4\%$, completely recovering to its initial position.

Day 3: UL Investor 1 completely recovers their losses as the value of their equity returns to \$2000.

Day 3: L The equity in the leveraged ETF increases to $\frac{1}{0.81} \times 1280 \approx \$1580$. The ETF rebalances in the opposite direction by taking out an additional \$300 of debt to purchase more equity. This results in \$1880 of equity and \$940 of debt, for a net position of +\$940. Note that the leveraged ETF has *not* recovered completely due to the reduction in equity as a result of the rebalancing.

As is shown in this example, the leveraged ETF is able to provide the leveraged return on the index for individual days, but due to the rebalancing process will not provide the correct return over longer time periods, which the alternative is able to. On the other hand, by rebalancing daily, the leveraged ETF guarantees that it is holding a greater amount of equity than debt (unless there is an unprecedented 50% daily fall in the market occurred). This means that the investor in the leveraged ETF can't lose more than their initial investment, which is not true for Investor 1, who has the potential to lose their initial capital and still be liable for the \$1000 debt.

An additional consideration for leveraged ETFs in the real world is that the rebalancing process does incur additional costs for the fund. Though these costs are fairly low on individual days, the rebalancing process can account for additional annual fees of $> 1\%$ in leveraged ETFs, and is the primary reason for their increased fees over the unleveraged alternatives.

1.2.3 Trackers

Trackers are a type of ETF or mutual fund, though the former is more common. Trackers contain a set of securities that strictly comprise a recognised market index. Trackers inherit the properties of their investment type, Exchange Traded Trackers, for example, are traded in real time as ETFs, whereas mutual fund trackers are traded daily.

The holdings of a tracker fund will generally only change to match changes in the constituents of the benchmark index, since they are simply a Mutual or Exchange Traded fund that contain a strictly defined set of securities.

1.2.4 Summary of Managed Funds

Return The return on any type of managed fund, passive or active, depends directly on its holdings and costs, which can again be in any type of security listed above. For Trackers and passively managed funds, returns are expected to be similar to the average return of whichever securities the fund holds. This is because the securities contained in such funds are rarely changed.

Typical returns from actively managed funds (Exchange Traded or Mutual) are quite similar to what could be expected from investment in an index fund, however the decisions of the manager can cause returns that deviate from the index in either direction. The returns seen in actively managed funds depend entirely on their prospectus, and how the manager's investment choices perform according to what is defined in the prospectus (geography, sector, etc.)

The median actively managed fund sees a lower return p.a. than the S&P 500 after fees are considered. These fees include; entry fees – one off fees of between 1–5% on deposits/contributions into the fund and management fees usually between 0.5 and 2.5% (avg. approx. 1.4%) per year. Levels of fund fees tend to be differentiated by

class, where the older fund classes have high entry costs and annual management fees, and some of the newer classes have lower (or zero) entry fees and low management fees.

Volatility The volatility of a managed fund depends directly on the volatility of the underlying investments. While investments in managed funds are considered to have relatively high volatility, the volatility of managed funds is less than that of the individual securities they track, as the diversification over a wide range of securities minimises the impact of any fluctuating stock price from an individual company.

There is still risk associated with these though as they often track a sector such as mining or technology, and hence any significant changes in the entire sector can result in significant volatility. Actively managed funds may have a high or low volatility depending on the funds prospectus and the investment strategy of the fund manager.

Liquidity Ease of liquidation is one of the main differences between the different varieties of managed funds. ETFs are highly liquid, similar to stocks, since they are traded continuously while markets are open. Because of this, liquidation of an ETF is usually possible within minutes during trading hours.

On the other hand, mutual funds are traded once daily, and therefore cannot be liquidated as rapidly when urgently required (sale typically takes 2–3 working days). In times of economic crisis the manager of a quality actively managed mutual fund may have an opportunity to change the holdings of the fund in order to avoid a significant decrease in value. However, when considering trackers, ETFs present a significant advantage over mutual funds since their ability to be liquidated more quickly provides an alert investor a significantly greater opportunity to divest from the fund and avoid the negative consequences of economic crisis.

It is also worth considering the fees associated with liquidating each type of fund. Generally the only costs associated with selling an ETF are the fees paid to the broker, however with mutual funds there can be a variety of fees. Certain classes of mutual funds are known to charge lower fees on purchase, and significant fees upon sale, where other classes will do the opposite. Certain mutual funds also charge early redemption fees to discourage short term trading. These fees exist on top of the brokerage fees that mutual funds have in common with ETFs.

The potential for greater fees, and the inability to trade continuously while markets are open, make mutual funds less liquid than ETFs. However both types of managed funds can be liquidated with relative ease when compared to term-based investments such as term deposits or bonds, or property, etc.

Capital Guarantee Most investments in managed funds, both actively and passively managed, are not capital guaranteed, however a small number of capital-protected investments do exist and offer this guarantee, but offer a low level of return (e.g. bond funds).

Risk Passively managed, and especially Tracker funds are subject to the type of market risk that was mentioned for stocks as they are simply tracking the performance of these securities. If the industry, sector, or geography that the fund tracks is subject to disruption then major fluctuations in the value of the fund's holdings can occur.

Active management reduces some elements of risk but increases others. Fund managers can closely monitor and control their portfolio, thus they have the potential to avoid major losses by liquidating or changing investments. The risk introduced by active management is simply that there will be an opportunity cost of investing in them over an index fund if the index fund outperforms them. This is a risk regardless of the past performance of the fund and so investment in active funds needs to be well researched as only **∼10% of actively managed funds have performed better than index funds over the last 10 years.**

There is also a small additional risk of funds closing in a state of duress, in this case shareholders will be paid out, however this amount will be less than the amount expected from the investment as managers will leave with a portion of the profit and other costs like legal fees can be involved.

1.3 Tax Advantaged Investment

1.3.1 Pensions

A pension is a type of retirement plan that provides monthly income in retirement. Pensions can either be self-managed or part of an employer's pension scheme. In relation to the employer's pension scheme the government insists that employers pay a portion of the employees annual remuneration into an employer pension scheme while you are working. For people who are self employed or who want to provide for additional security in

retirement, it is possible to set up a self managed pension scheme in lieu of or in addition to the employers pension scheme.

In either case the government provides some tax incentives to individuals to encourage them to prepare for their retirement. In Australia a personal contribution of 1000 AUD will be matched with a co-contribution by the government of 500 AUD at the end of the financial year, $500 is the maximum amount. In many countries including Australia money invested in pensions is exempt from being taxed or is **tax advantaged** up to a limit meaning that contributions made to their pension are deducted from their income before tax. In Australia the maximum superannuation contribution in the 2022–23 financial year is 137,500 AUD, $27,500 of which is taxed at a fixed 15% rate, and the remaining $110,000 at the investor's marginal rate. The maximum total amount that can be stored with a tax advantage in super varies between countries, and in Australia the maximum (in 2023–24) is currently 1.9 million AUD.

The benefit of 'wrapping' a portion of your investments as a pension is the associated tax advantage. In relation to the employer's pension scheme the employer will usually engage the services of a pensions or investment manager to manage the investments of their staff. In relation to the self managed pension scheme an individual can either use an investment manager or invest the funds themselves in approved investment types. Self-managed pensions can be invested in whatever approved investment type the person chooses, and so sees return, risk and volatility based on the investment portfolio.

In either situation the individual will not have access to these funds until they reach the retirement age, which for men is 65 years of age and for women between 63 and 65 years of age (which varies based on the current age). Once an individual reaches retirement age the money will usually be paid as a monthly deposit in retirement, or as a lump sum under certain circumstances.

Return Returns depend entirely on the portfolio of investments that the pension is held in. Australian superannuation funds have seen average returns over the past 5 years of between 5.9% and 9.4% per annum. Fees can be along the lines of 0.1% upon exit, and administration fees are often a fixed rate of approximately $100 per year or otherwise a percentage fee of ∼0.1% each year on average.

When using a self-managed pension as a tax wrapper one can expect to see slightly higher returns than if they made the same investments outside of a pension plan due to the tax benefits available to them and the lower fees charged due to government regulation.

Volatility The volatility of a pension plan depends on the type of investment chosen by the investor or types of investments made by the managing fund.

Liquidity Pension funds cannot be liquidated until retirement and only after a minimum age specified by the country the plan is held in. In Australia the age at which superannuation can be accessed is between 55 and 60, depending on the birth year of the person and this age increases with the growing life expectancy. It is possible to access the money as a lump sum, or income stream after this time, when accessing via an income stream the remaining money can continue to be invested.

Capital Guarantee The capital guarantee of a pension depends on what the underlying investments are made in.

Risk Pension funds are usually guaranteed similar to banks and annuities, the risk associated with them is thus relatively low. Self-managed pensions are subject to risk according to what the underlying investments are made in. This risk can be changed over time by changing the types of investments.

1.4 Conclusion

Having considered many of the most common and accessible investment options in this chapter it is worth considering which of these are most appropriate for long-term, low-maintenance, hands-off investing. Looking through the options that were covered in this chapter it's clear that cash, term deposits, and annuities simply do not provide returns that are competitive with the other available options. Some of these do not even beat CPI. The same can be said of investment-grade bonds, and high-yield bonds confer too much risk for an investor looking for a secure place to put their money.

While property investments in the correct geographies can provide competitive returns, maintaining a property can be both costly and time consuming. On top of this, property can be a risky investment that is difficult to liquidate, making property an unsuitable option for a hands-off investor. Investing in commodities and stocks

from individual companies is a similarly involved process, requiring frequent maintenance and management to avoid major losses.

This leaves the managed fund options; mutual funds and ETFs. Each of these has the potential to generate competitive returns, but with lower risk than investment in individual stocks due to diversification. As well as being diversified, *actively* managed funds have a management team that monitor their performance and make decisions to minimise losses and attempt to capitalise on opportunities for increased returns.

It seems clear that one of these managed fund options will be most appropriate for a low-maintenance investment. The next chapter will therefore attempt to narrow down the geographies and market sectors that are most appropriate for long-term investment. Chapter 3 will consider the best brokers for making such an investment, and Chapter 4 will look at the specific funds that are expected to be most appropriate for the client of this report.

Chapter 2

Global Stock Markets

This section looks at various stock markets that operate around the world and investigates their returns and volatility over the last 3 decades. It aims to determine which geographies and market sectors have seen the highest level of growth over this period, and considers the reasons for this growth to speculate whether the same sectors and geographies will continue to provide strong returns in the future.

First a set of stock exchanges is selected from a list of global stock exchanges with the largest market capitalisation. Next, a set of indices which represent either individual exchanges, or entire sectors/geographies is chosen. The performance of these indices is compared using data from the past 30 years (1992–2022), and recommendations for the most profitable sectors and geographies are made based on these results. Note that figures and statistics in this chapter and the corresponding appendices were recorded in January 2023.

2.1 Stock Exchanges

Appendix A shows a list of the 21 global stock exchanges with a market capitalisation of around or over 1 trillion USD. These exchanges capture approximately 87% of the global market. Some other statistics about these exchanges follow:

- The total market capitalisation of these top 21 stock exchanges is approximately 105.7 trillion USD.
- Out of the top 21 exchanges, the USA captures 45.6 trillion USD or 43.1% with the New York and Nasdaq stock exchanges.
- $\sim$85% of the value in these top 21 is captured by the top 10 largest stock exchanges (85.9 trillion $\approx$ 80.2%).
- The Australian Securities Exchange (ASX) ranks 17th by market capitalisation and is based in Sydney, but only captures 1.5% of the value in the top 21 exchanges.
- The Shenzhen Stock Exchange (SSE) ranks 5th by market cap, however the monthly trade volume is the 3rd largest, behind only the US Exchanges.
- The Nasdaq Nordic and Baltic Exchanges are a collection of 7 subsidiaries of Nasdaq Inc. that operate marketplaces in the Nordic, Baltic, and Caucasian regions of Europe, and is considered to be a single exchange in this table, ranked 15th by market cap.

Appendix B Figure B.1 gives a visual representation of these points. Most clearly it shows the enormous market share captured by the New York and US Nasdaq exchanges.

2.2 Index Performance

This section looks at some of the top global stock exchanges mentioned previously and examine their performance more closely. Since the exchanges themselves are not tradeable securities, the best way to do this is by looking at capitalisation-weighted indices that track large sets of securities from each exchange.

In addition to indices which restrict themselves to individual exchanges, some are included that instead focus on entire geographies. The MSCI world index is also included as a benchmark that considers the performance of stock markets globally.

2.2.1 Index Selection

The following indices were selected as they provide a well-rounded global perspective for stock market performance. In addition to this, they are considered relevant to the interests of the client of this report who is based in Australia and the UK and invests globally and in the USA. The chosen indices were the:

STOXX Europe 600 which tracks the top 600 companies across any of the European stock markets.

Nasdaq Composite (USA) which tracks nearly all companies (circa 3,800) listed on the Nasdaq stock exchange (one of the two US exchanges).

Russel 3000 (USA) which seeks to benchmark the entire US market by tracking the top 3000 largest companies from both the Nasdaq and New York Stock Exchange (NYSE).

S&P 500 (USA) which, very similarly to the Russel 3000, tracks the top *500* securities available on the US exchanges (Nasdaq and NYSE).

Shanghai SE Composite (China) which is an index tracking all stocks traded on the Shanghai Stock Exchange (the largest of the three exchanges in China).

Hang Seng Composite (Hong Kong) which tracks approximately 500 of the largest companies trading on the Stock Exchange of Hong Kong. This set of around 500 covers approximately 95% of the largest companies on the exchange.

Nikkei 225 (Japan) which is an index for the Tokyo stock exchange, including the top 225 companies by market capitalisation.

FTSE All Share (UK) which, despite its name, tracks approximately the top 600 of the over 2000 companies traded on the London Stock Exchange.

Australian All Ordinaries which tracks the share prices for the 500 largest companies listed on the Australian Stock Exchange (ASX).

S&P ASX 200 which, similarly to the All Ordinaries, tracks only the top 200 companies from the ASX.

In addition to these indices which track securities available in a single market, a global index is included, which contains securities from all over the world. This is the **Morgan Stanley Capital International (MSCI) World Index**.

2.2.2 Analysing Index Performance

Firstly, the performance of all these indices over the last 30 years (1992–2022) will be compared. When this is not possible for an index as data does not exist for the whole time, another index believed to track similar securities will be chosen, and the assumption is made that the index that did not start in 1992 performed exactly like the chosen similar index for the missing time period. This was required for:

- The S&P ASX 200, which started in November 1992. This index will diverge from the Australian All Ordinaries at that date as they both follow the Australian market.
- The Shanghai Stock Exchange Composite Index, for which data begins in Q2 of 1992. This will diverge from the Nasdaq Composite index as although they follow different markets, they have had the most similar performance since 1992.
- The MSCI World index, which will diverge from the S&P 500 once it begins in August of 2004.

A plot detailing the performance of these indices can be found at `https://www.lfern.com/extra/finance/complete-graph`. This allows zooming and toggling of individual indices, and is the recommended viewing method. For this report, some excerpts from the graph are shown in Appendix C.1.

These include Figure C.1, which shows the performance of all the indices over the 1992–2022 time period. Then Figure C.2 has been modified by removing some of the indices that are similar in construction and performance to each other. For example the Russel 3000 has been dropped in favour of the S&P 500 as both represent the general US market. In addition, the S&P ASX 200 has been dropped in favour of the All Ordinaries as both track the general Australian market. In addition, the FTSE All share index is dropped in favour of the STOXX 600, which is a broader-based index that includes securities from the FTSE All Share index.

Appendix C.3 then further removes the Nasdaq to provide greater detail about the lower performing indices.

Appendix D Table D.1 then gives a more detailed look at the performance of all these indices over each 10 year period in the 1992 – 2022 window and also provides an annualised compound interest rate for the 20 year periods beginning in 1922 and 2002 as well as the entire 30 year period.

Some notable points derived from the table and graphs in appendices C.1 through D follow:

- The Japanese Nikkei 225 is the worst performing index analysed, showing returns over the entire 30 year period that are only slightly above zero (1.5% p.a.). Note that these figures are calculated in Money of the Day, and that in real terms (after considering inflation), the performance is negative.
- The broad based US indices, the Russell 3000 and S&P 500, see extremely similar performance to each other over the entire period as would be expected. This is due to the fact they are constructed from many

of the same companies, to the extent that the S&P 500 is effectively a subset of the Russell 3000's top 500 companies.

- The Nasdaq composite index sees higher annualised returns over the entire period than most other indices, including all of the US and European options, especially since 2002. It also sees a significantly increased volatility over all these options, indicating that the increased risk is correlated with an increase in potential reward.
- The SSE exhibits even greater volatility than the Nasdaq, and the overall performance of this index therefore changes drastically based on the start date and end date that are selected. In this report the dataset with the earliest available inception date was used.
- While the SSE outperforms the Nasdaq for some selected time periods, it is also massively more volatile. On this basis we conclude that the Nasdaq has the best risk-weighted performance.
- Europe has not been a great place to invest since the year 2000. With the 2002–2012 annualised return of the STOXX 600 beating only the Nikkei 225, and the 2012–2022 annualised return being a relatively low 4.1%. An overall return of 3.7% over the 2002–2022 time period is also one of the poorest results.
- Over the 30 year period many indices showed modest returns of less than 6% p.a.. Namely the Australian All Ordinaries, the Australian S&P ASX 200, Nikkei 225, the STOXX 600 in Europe, and the SSE and Hang Seng indices.
- Over the 30 year period the best performing index was the Nasdaq, tracking the technology sector in the USA. This performed at 9.6% p.a.
- The fully diversified, Global, MSCI World Index delivered 5.5% p.a. over the last 30 years, compared to cash rates of 2–3% p.a.
- The best performing index, the Nasdaq, delivered a return of 7.4% p.a. in the decade 1992 to 2002, 8.4% p.a. in the decade 2002 to 2012 and finally 12.9% p.a. in the decade 2012 to 2022.
- By far the top performer for the last decade has been the USA markets with returns of between 10.1% and 12.9% per annum.
- Apart from the Nikkei 225, all of the indices show a positive return over each of the 20 year periods.
- Appendix D shows that the MSCI World index has performed in the middle of the pack over the past 30 years. This reflects its construction as a global index comprising securities from both the higher and lower-performing indices.

2.2.3 Where to Invest

Considering the results found in the above analysis of global indices, it is worth summarising the findings in terms of which geographies and market sectors are most appropriate for investment.

2.2.3.1 Geographies

Looking first at geographies it is clear that the best risk-weighted returns have been seen in US markets, which outperformed others by multiple percent p.a. over most of the measured periods. While the Chinese market also performed relatively well it is clear from the figures that this market is significantly more volatile than that of the US. Further, other reasonably well-performing indices such as the FTSE All Share index and Australian indices simply can't compete with the exceptional returns seen in the US.

This data showing superior performance in the US is not too surprising, since the country is a key place for technology-driven innovation. In the following section it is shown that the US technology sector has seen unprecedented growth over the last 30, and especially last 20 years, which is one of the primary reasons for the strong performance of US indices overall.

2.2.3.2 Market Sectors

From a best-practice investment perspective, it is well known that diversification (across both sectors and geographies) provides a lower level of risk. With this in mind, one may be inclined to consider investing in the Russel 3000 (which comprises the largest 3000 companies on the American stock markets). This is the most diversified of the US indices and has returned a competitive 7.5% p.a. over the last 30 years. Whilst it is tempting to think that companies listed on US markets are doing business in America, it is clearly the case that these companies are diversified across the world, and so, the Russel 3000 gives an investor exposure to all the major markets across the world.

This makes the Russel 3000 a competitive option, and comparing to the S&P 500 (which tracks only the largest 500 of the companies in the Russel 3000) it is hard to justify choosing the less diversified index. It is not surprising that the two track so closely over the last 30 years (the S&P 500 performed only 0.03% better overall), since both indices are *capitalisation weighted*. Because of this, the same few giant companies are responsible for the majority of the holdings in both indices.

Interestingly, most of these giant companies are in the technology sector, which has performed exceptionally well in the last 30 years, especially since 2000. Because these enormous tech companies are responsible for most of the holdings of the aforementioned diversified indices, it is worth considering how the tech companies perform in isolation.

This brings us to the Nasdaq Composite index, which tracks almost all stocks traded on the Nasdaq stock exchange (approximately 3,900). These are mostly technology and internet-related, but financial, consumer, biotech, and industrial companies are also included. Because of its specialisation in these areas that have grown rapidly over the past 30 years, the Nasdaq sees an unrivalled 30 year performance of 9.6%. Over the last 20 years the result has been 10.6%.

While investing in the Nasdaq does sacrifice some diversification and increase volatility over the Russell 3000, the additional 2% return p.a. justifies this for many investors. As was stated for the Russel 3000 above, while the Nasdaq companies are American owned, they are very much global in terms of their market reach.

For a perspective on why one might invest in the Nasdaq, consider an investor with $100k that puts 95% of their savings into the S&P 500, and holds the remaining 5% in cash for emergencies. With the S&P 500 performance of 7.5% over a decade, their $95k investment becomes $196k.

Alternatively, consider the same investor putting their money in the Nasdaq. In this case it would be reasonable for them to retain twice as much in cash, due to the increased risk of the less diversified index. If they therefore invest only $90k for the same 10 years at the 9.6% p.a. return of the Nasdaq, this becomes $224k.

This dramatic difference caused by the compounding effect of the higher interest rate is a strong argument in favour of the Nasdaq. This, combined with the performance of technology indices globally make a compelling case for investment in the technology sector.

2.3 Conclusion

With the above analysis in mind it seems clear that the US stock markets are the most appropriate choice for investment. The country has seen the largest growth in it's diversified indices and is a key location for innovation in technology globally.

Considering the various indices available in the US, arguments can be made for the diversified options like the Russel 3000 as well as the technology focussed Nasdaq. Deciding between these will depend on the profile of the investor, their tolerance for risk, and the duration for investment, but the technology sector has clearly shown unrivalled levels of growth over the last few decades, making the Nasdaq the clear choice for maximising returns for long-term investors.

The following chapter details a comprehensive investigation into brokers whose services could be used to purchase and hold such securities. As a result of the analysis above this will be done with a specific focus on brokers that offer mutual funds, ETFs, and trackers on US stock markets.

Chapter 3

Selecting a Stock Broker

Investments in securities must be made through a stock broker. Stock brokers exist both online and offline but since the industry is increasingly transitioning online this report considers online options.

The first step of the process is to find the best independent stock broker comparison tool. Once this comparison tool is identified, we then use it to choose the best stock broker according to the needs of the client.

3.1 Stock Broker Comparison Tools

A couple of sites exist to assist with comparison and selection of brokers. Most of these compare only a very small number of options, often in a limited geography (USA, Europe, Australia etc.) and do not cover a comprehensive range of features that are important to making an appropriate choice. On top of this, many of the sites are sponsored by specific brokers to advertise their service above their competitors.

After extensive research, the best site found, by a large margin, was brokerchooser.com. This resource compares 102 brokers from all regions of the world on a comprehensive selection of features.

3.2 BrokerChooser's Methodology

Although BrokerChooser receives a commission from some partners, BrokerChooser's recommendations and rankings are based on their methodology, independent from partnerships they have. BrokerChooser considers 9 aspects of a broker's performance and rates each aspect (except safety) out of 5. They also provide an overall score for each broker.

Section 3.4 goes into detail about each of the 9 factors and outlines a method for scoring each factor based on how suitable it is for the client described in Section 3.3 below. These client-specific ratings are based on research conducted largely using BrokerChooser's services with some additional independent research.

3.3 Client Profile

The remainder of Chapter 3 will investigate brokers with the aim of making a choice of the best broker for a specific investor. This analysis may not be relevant to an investor who does not fit this profile.

Since the client has specific needs that are different from a general investor, these are identified in the following subsections in order to make an appropriate recommendation.

3.3.1 Client Specifications

- The investor chooses to operate out of Australia, which places a significant restriction on the amount of brokers that can be considered. Someone based in a different location may face a different set of options.
- The investor places extreme importance on the security of their invested funds and is looking for a broker which is regulated by multiple reputable authorities. They are willing to discard options which do not offer an exceptional level of security for their investments. A more comprehensive description of their safety requirements appears in Section 3.4.9.
- The investor plans to invest between a few hundred thousand and a few million Australian dollars.
- The investor is *not* a day trader and will instead be investing long-term in ETFs, trackers, and mutual funds.

3.3.2 Client Preferences

An ideal broker for this investor will have a fee structure that caters well to investments in mutual funds and ETFs, where positions will be held for many years, and trades will be made approximately annually. The broker must provide a very high level of security for their assets, and meet the other non-negotiable requirements outlined in the previous section.

A quality trading platform will be favoured, as well as good customer service, and a large selection of mutual funds and ETFs. Aspects such as the Research and Educational tools are less important and the investor is willing to put effort into a more complex account opening process if the broker provides a quality service.

3.4 Client Rating System

Considering the client's requirements defined above, a system has been developed to provide each available broker with a numeric score evaluating their overall desirability based on the 9 factors identified by BrokerChooser. Sections 3.4.1 through 3.4.9 explore each of these factors and a process is developed for scoring them in a way that will select the most appropriate for the client's needs. Then Section 3.4.10 develops a method of weighting each of these 9 scores to generate a final selection score.

3.4.1 Fees

Brokers charge both trading and non-trading fees. Trading fees are charged for the purchase of securities through the broker and are usually either a flat rate or a percentage of the value of the trade. The value of a percentage fee can have a minimum and/or maximum amount.

Non-trading fees include deposit/withdrawal fees, inactivity fees and custody fees. Not all brokers charge fees in all of these areas, but withdrawal often incurs a flat rate fee, and inactivity fees are charged by many brokers after an account has not made any trades for a specified amount of time. Custody fees are charged by a few brokers, usually as a percentage of the value of the securities held in an account. These fees are often subject to an annual cap, and may be a fixed annual amount with certain brokers.

It is ideal to minimise fees with any broker.

Rating Fees

Fees for each of the brokers will initially be rated out of 15, this score will then be scaled down linearly to a score out of 5.

Brokers will be scored on their custody and trading fees as these are the most impactful to the overall costs of investment.

The weighting of these scores serves to place twice the importance on custody fees than trading fees to reflect the investment style of the client (non-trading).

Points will be awarded to a brokers custody fees as follows (with all dollar values in USD):

- +10 for custody fees of $\leq 0.1\%$ p.a. or less than \$200 on a \$200,000 investment,
- +8 for custody fees $> 0.1\%$ but $\leq 0.2\%$ p.a. or less than \$400 on a \$200,000 investment,
- +6 for custody fees $> 0.2\%$ but $\leq 0.3\%$ p.a. or less than \$600 on a \$200,000 investment,
- +4 for custody fees $> 0.3\%$ but $\leq 0.4\%$ p.a. or less than \$800 on a \$200,000 investment,
- +2 for custody fees $> 0.4\%$ p.a. or more than \$800 on a \$200,000 investment.

And for trading fees:

- +5 for a flat fee of <\$20 per trade,
- +4 for a flat fee of $\geq$ \$20 but <\$30 per trade,
- +3 for a flat fee of $\geq$ \$30,
- +2 for a percentage fee of <0.1% of the trade value,
- +1 for a percentage fee of $\geq$0.1% of the trade value.

This score out of 15 will be divided by 3 to give the score presented out of 5.

3.4.2 Account Opening

Opening an account with a broker can be either a fully online process or have an offline component. Fully online account opening is ideal as the registration and verification times do not have to include the extra days that it takes to prepare, have notarised, and post physical documents, sometimes overseas. Some brokers even require

meeting with a representative for account verification which adds extra time and difficulty to the registration process.

A simple, online process is favoured as it saves time and effort, however it is worth still considering brokers with a challenging account opening process if they excel in other areas as the process only has to be completed once.

Rating Account Opening

The account opening process of each of the brokers will be rated out of 5 based on the following system.

The score will start at 5 and receive deductions of;

- -2 points if the process is not fully digital,
- -1 point if the process takes more than 5 days,
- -1 point if it is required to meet with a representative.

3.4.3 Deposit and Withdrawal

The deposit and withdrawal score considers attributes of the deposit and withdrawal process such as the speed at which transfers are processed, the amount of base currencies that the broker supports depositing into, and whether or not there are fees for depositing and withdrawing money. The availability of different deposit options also contributes to the score, as different brokers will offer combinations of bank transfer, credit/debit card and electronic wallets.

Low or no deposit fees are preferred, alongside fast speeds, a good range of base currencies and availability of all deposit options.

Rating Deposit and Withdrawal

The deposit and withdrawal process of each of the brokers will be rated out of 5 based on the following system.

The score will start at 0 and be incremented;

- by 0.1 for each base currency available (up to 1 point),
- by 1 if AUD is offered as a base currency,
- by 1 for each payment method available out of bank transfer, credit card, and BPAY (up to 2 points),
- by up to 1 point depending on the cost and complexity of the withdrawal process.

3.4.4 Trading Platform

Brokers often offer 3 types of trading platforms to manage an account. These are web, mobile, and desktop clients. A desktop client is an application that can be downloaded on the computer and used separately to the web browser. It is ideal to have all of these available, and for each of the platforms to be feature-rich, customisable, intuitively designed, and present fees in a clear way.

Rating Trading Platforms

The trading platforms of each of the brokers will be rated out of 5 based on the following system.

The score will start at 0 and be incremented;

- by 1 point for each platform available (from Web, Desktop, and Mobile)
- by up to 2 points to reflect the quality of the platforms.

3.4.5 Markets and Products

The markets and products score considers the range of asset classes that a broker offers and their available selection of each type of asset. To achieve a high score in this category, a broker should offer all of; stocks,

ETFs, forex, and mutual funds. Where applicable, they should also offer a large selection of each type of asset (e.g. a large amount of mutual funds or ETFs).

It would also be valuable to consider the fund manager's fees associated with investments in mutual funds, as different brokers offer different fund classes that have various levels of fees. Morningstar defines 3 categories of mutual fund classes; *unbundled*, which have only management and fund operating fees, *semibundled*, which may additionally share revenue or pay a sale fee to the broker, and *bundled*, which may have additional commissions, loads, transaction, and operating fees. The classes with lower fees are clearly more desirable, but unfortunately BrokerChooser does not report on the fund classes made available through each broker, and this was therefore not considered in the rating system.

Rating Markets and Products

The markets and products of each of the brokers will be rated out of 5 based on the following system.

A score of 5 is awarded to the broker with the largest number of mutual funds available, and the score for other brokers is linearly proportional to the amount of mutual funds they offer. Interactive Brokers offers the largest number of mutual funds at 46,000, therefore a broker with 23,000 mutual funds will receive a score of 2.5/5.

3.4.6 Research

Most brokers offer a range of research tools to educate users on making quality investments. These can include trading ideas, news, charts, data on fundamentals, and technical analysis. Some brokers partner with third parties such as Morningstar or Trading Central to provide access to their services. It is important to know that these tools can be found elsewhere online as this means it is not crucial for a broker to provide them.

Rating Research tools

The rating for the research tools of each of the brokers will be taken from BrokerChooser as their analysis is suitable for the client's needs.

3.4.7 Customer Service

The customer service score is based on the quality of service, the times at which it is available, and the channels that can be used to make contact. High quality, fast, 24/7 support is ideal, and a broker with good customer service will offer support by phone, email and live chat.

Rating Customer Service

The customer service of each of the brokers will be rated out of 5 based on the following system.

The score will start at 0 and be incremented;

- by 1 point for each channel available (from phone, email, and live chat),
- by up to 2 points to reflect the quality of the service, including the impact of any difference in time zone and opening hours.

3.4.8 Education

The education score is based on the range and quality of educational materials provided by the broker. This is different to the research tools as educational tools are focused more on effectively using the brokers platforms and becoming a better investor, as opposed to research which is designed to educate a user on current events and provide trading advice and opportunities.

Demo accounts, instructional videos, webinars and educational articles all contribute to a good score for education.

Rating Educational tools

The rating for the educational tools of each of the brokers will be taken from BrokerChooser as their analysis is suitable for the client's needs.

3.4.9 Safety

The safety analysis of a broker considers how confident an investor should be that their investments will be held securely by a broker. There are five factors that are important to the safety of any given broker, these are:

- Whether the broker holds a banking license and the jurisdiction of the license.
- Whether they are listed on a stock exchange and which one.
- Which authorities they are regulated by.
- The amount of financial protection they provide on cash they are holding.
- How long they have been operating.

It is valuable for the broker to hold a banking license as this subjects them to additional auditing and adds other requirements such as a minimum amount of capital they must hold, a minimum number of directors and disclosure of beneficial shareholders. The granting of the license may involve a long, complex and expensive procedure providing an additional layer of confidence in the broker's safety.

Whether they are listed on a stock exchange is similarly important as being a public company requires releasing a lot of financial information publicly, which has been verified by external auditors. The country which the broker is registered in and the stock exchange they are listed on are important as this determines what they are required to release and the extent of the supervision.

Brokers will be regulated by different authorities depending on which countries they operate in. Some regulatory authorities such as the US Securities and Exchange Commission hold brokers to higher standard than others, so it is important to consider which authorities regulate a broker.

The financial protection provided by a broker is how much of an investors cash held with the broker is guaranteed in case the broker becomes insolvent. Finally, the amount of time the broker has operated can be a good indicator of their reliability.

Rating Safety

The safety of each of the brokers will be rated out of 5 based on the following system.

The score will start at 0 and be incremented;

- by up to 1 point if the broker holds a banking licence, with the score depending on the jurisdiction of the license,
- by up to 1 point if the broker is listed on a stock exchange, with the score depending on which exchange,
- by up to 1 point depending on the reputation of the institutions that regulate the broker,
- by 1 point if a suitable cash guarantee is provided (minimum 100,000 USD),
- by 1 point if the firm has been operating for at least 10 years.

3.4.10 Broker Selection Process

Having established a customised scoring system, BrokerChooser's broker comparison website (`https://brokerchooser.com/compare`) is now used to compare available brokers. To begin narrowing down the range of brokers, the options that were unavailable to Australians or didn't offer either mutual funds or ETFs were removed. This reduced the original range of 102 down to 7.

This set of 7 includes MEXEM, and CapTrader, which are *introducing brokers* to Interactive Brokers. This means that they provide an interface for buying and selling securities, but delegate the operational work of actually purchasing and selling them to Interactive Brokers. Because of this their fees are generally higher, and further research shows that their security is strictly worse than what Interactive Brokers offer.

Because each of these 2 introducing brokers was found to be inferior to other options in a preliminary review, the remaining set of 5 (Swissquote, Interactive Brokers, Vanguard, TradeStation, and Saxo Bank), were investigated in more detail. This research is presented in Section 3.5.

To give an overall score to each broker and ultimately select the best option for the client, a weighted average of each of the 9 individual aspect scores (determined by processes outlined in sections 3.4.1 through 3.4.9) for

each broker will be calculated. Since not all attributes are equally important to the client, the attribute ratings will be weighted as follows:

- A weight of 1 for Education and Research as these can be found elsewhere online,
- A weight of 2 for Account Opening, Deposit and Withdrawal, and Trading Platforms, since account opening will only occur once and the trading style of the investor means that few withdrawals will be made and trades will be infrequent,
- A weight of 3 for Customer Service,
- A weight of 4 for Fees and the range of Markets and Products as these are essential to maximising the value of the investment; and,
- A weight of 5 for Safety since the level of acceptable risk is extremely small.

To compute the overall score for each broker using these weights the following process is performed.

1. Each attribute is scored out of 5 using the scoring systems defined above. These scores are out of 5 so that they can be compared with the individual attribute ratings provided by BrokerChooser (which also have a maximum of 5).
2. To compute the overall score, each attribute score is divided by 5 (giving a score out of 1) and is then multiplied by its attribute weight.
3. These weighted attribute scores are summed across all attributes of a broker, giving the broker a total score out of 24.
4. This total score is multiplied by $\frac{5}{24}$ to give a total score out of 5, which can again be compared directly with the overall score provided by BrokerChooser (which also has a maximum of 5).

3.5 Broker Analysis

This section will analyse and summarise the features of the 5 brokers that remain after removing options that did not offer both mutual funds and ETFs and those who do not cater to Australians. In analysing the fees of each broker, their trading, custody and inactivity fees are all considered.

Both BrokerChooser's rating, and a rating specific to the needs of the client are provided for each broker's performance in each category.

3.5.1 Swissquote

Summary – Swissquote offers an excellent service that is very suitable for the needs of the client. Their non-trading fees and fees on fund trades are mid-range, but their selection of mutual funds is very good, and they differentiate themselves with exceptional safety due to regulation from many authorities and the provision of significant financial protection.

Their trading platforms, while not the best of all brokers, provide all the required functionality and the signup process is relatively simple and online. Their educational and research tools, and customer service are all high quality and nice to have.

Swissquote Overall Rating

BrokerChooser Rating: 4.5/5.0

Client Specific Rating: 4.4/5.0

Swissquote receives the best overall score of 4.4/5.0 since it meets the needs of the client in every category and offers such a wide range of funds.

Swissquote Score Summary Table

Factor	BrokerChooser Score (/5)	Client Specific Score (/5)	Weight	Weighted Score (Sum/24)
Fees	1.8	5.0	4	4.0
Account Opening	4.0	5.0	2	2.0
Deposit/Withdrawal	4.6	4.5	2	1.8
Trading Platform	4.3	3.8	2	1.5
Markets and Products	5.0	3.2	4	2.6
Research	3.3	3.3	1	0.7
Customer Service	5.0	4.0	3	2.4
Education	5.0	5.0	1	1.0
Safety	N/A	5.0	5	5.0
Total	4.5/5.0	38.8	24	4.4/5.0

3.5.1.1 Fees

Swissquote's fees are neither very high or low. Their trading fees for stocks, ETF's and bonds are relatively high, but importantly the fees for trading funds are below average. Trading funds with Swissquote's "Prime Partners" (which include many of the major fund providers) is at a flat rate of 9 USD per trade, however trades with other fund providers that they hold are at a rate of 0.5% with a minimum fee of 50 Swiss Francs (CHF; 1 CHF ≈ 1.2 USD as of 2024/01/03) and no maximum. This is a relatively large disadvantage for anyone investing above 10,000 CHF as 0.5% is greater than 50 CHF on a trade above that value. The impact of this depends heavily on whether or not it is possible to find excellent funds offered by their Prime Partners. A majority of the best performing funds offered by Swissquote are from Prime Partners.

Swissquote does not charge an inactivity fee, but they do charge a quarterly custody fee, which is capped at 50 CHF for assets ¿150,000. For customers with over 1M CHF invested, an additional 0.0075% custody fee is charged. Note that because of the cap on the other custody fee the total fee will never be greater than 0.1% p.a.

Swissquote Fees Rating

BrokerChooser Rating: 1.8/5.0

Client Specific Rating: 5.0/5.0

Since the majority of Swissquote's funds are provided by Prime Partners, their trading fees will be taken to be 9 USD. Additionally, their custody fee is less than 0.1% per annum. Because of this, Swissquote qualifies for a perfect score of 5.0/5.0 in fees, even though lower fees can be achieved with other brokers.

3.5.1.2 Account Opening

To open an account and trade in the anticipated volumes with Swissquote the account opening process should be painless, as it is fully digital and relatively fast. This will require a trading account as this allows trading of Funds.

Swissquote Account Opening Rating

BrokerChooser Rating: 4.0/5.0

Client Specific Rating: 5.0/5.0

Since Swissquote has a fully digital process that an be completed in only a day they receive a perfect score of 5.0/5.0

3.5.1.3 Deposit and Withdrawal

Swissquote now offers over 20 base currencies for trading funds in their Multi Currency accounts. The deposit and withdrawal process is quick compared to other brokers, however there is a 10 CHF fee on withdrawal. BrokerChooser claims that credit/debit card are not offered for transfers but this is appears to have changed.

Swissquote Deposit and Withdrawal Rating

BrokerChooser Rating: 4.6/5.0

Client Specific Rating: 4.5/5.0

Swissquote gets a score of 4.5/5.0 for Deposit and Withdrawal since they offer a wide selection of base currencies including AUD. They receive 2 points for offering Bank Transfer and card, and 0.5/1.0 for the complexity of the process.

3.5.1.4 Trading Platform

Swissquote's web trading platform offers a good level of workspace customisability which is one of its strengths, it also offers 2-factor authentication for increased security. Generally the platform is feature-rich but it would be nice if fee reports could be accessed more easily.

Unfortunately Swissquote does not offer a desktop platform, but their mobile trading platform will provide all the desired features. Biometric authentication is an excellent addition to the mobile app for extra security.

Swissquote Trading Platform Rating

BrokerChooser Rating: 4.3/5.0

Client Specific Rating: 3.8/5.0

Swissquote's platforms receive a score of 1.8/2.0 for quality, and since web and mobile platforms are offered they get a score of 3.8/5.0.

3.5.1.5 Markets and Products

Swissquote has a large selection range of mutual funds and ETFs. Exact information is inconsistent between BrokerChooser and Swissquote's official website, with the former claiming 13,000+ funds from 340 providers, and the latter claiming to offer 20,000+ from only 200+ institutions.

Swissquote Markets and Products Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 3.2/5.0

Considering that Swissquote may be aggregating some fund providers in their definition of an institution their Markets and Products performance will be evaluated on the basis of 340 fund providers and 20,000 funds. Since these numbers are not exact, both will be considered and averaged when comparing to Interactive Brokers' 46,000 funds and 400 fund providers. This gives a score of $\frac{1}{2} \times \frac{20{,}000}{46{,}000} + \frac{1}{2} \times \frac{340}{400} \approx 3.2/5.0$, though it is worth noting that Swissquote's selection includes the vast majority of major funds.

3.5.1.6 Research

Swissquote provides both free and paid research tools, their free tools are of average quality and BrokerChooser does not review the paid resources. This is not a big issue as research tools can be found elsewhere online.

Swissquote Research Rating

BrokerChooser Rating: 3.3/5.0

Client Specific Rating: 3.3/5.0

There is no reason to adjust BrokerChooser's rating of 3.3/5.0 for the client.

3.5.1.7 Customer Service

Customer service times are short over the phone and take about a day over email. The live chat also has an acceptable response time. These services open at 8am CET, which is 4pm AEST and close at 6am AEST. This is not ideal as the support is unavailable during a large portion of the day but can be accommodated.

Swissquote Customer Service Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 4.0/5.0

Swissquote offers a reasonable quality of customer service, but unfortunately the opening hours are poorly aligned with Australia. 1/2 points are awarded for quality and 3 for the availability of all channels for a total 4.0/5.0.

3.5.1.8 Education

Swissquote has many high quality educational tools available for free to account holders.

Swissquote Education Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 5.0/5.0

There is no reason to disagree with BrokerChooser's perfect score.

3.5.1.9 Safety

Banking License – Swissquote holds banking licenses in Switzerland, Malta, Dubai and Hong Kong.

Stock Exchange – Swissquote is listed on the SIX Swiss Exchange, which is a big plus for safety as Swissquote releases financial statements regularly and transparently.

Regulators – They are regulated by many regulatory authorities including the Swiss Financial Market Supervisory Authority (FINMA) and the UK's Financial Conduct Authority (FCA) as well as the Securities and Futures Commission (SFC) of Hong Kong and the Dubai Financial Services Authority (DFSA).

Cash Guarantee – Should Swissquote become insolvent, securities are fully guaranteed and cash up to 100,000 CHF is guaranteed by the Swiss Bankers Association (SBA).

History – Swissquote (CH) was established in 1996, while Swissquote (UK), the forex division was established in 2008.

Swissquote Safety Rating

BrokerChooser Rating: N/A

Client Specific Rating: 5.0/5.0

Swissquote has every desirable aspect of a safe broker, hence they receive a perfect 5.0/5.0 score

3.5.1.10 Conclusion

Swissquote provides a service that is well suited to the client of the report. The fee structure caters well to their investment style, and the trading platforms, research, and educational tools are all of a good quality.

Swissquote achieves the top score of 4.4/5.0 according to the client's rating system. They differentiate themselves from other brokers with the excellent security they offer and their large selection of mutual funds.

3.5.2 Interactive Brokers

Summary – Interactive Brokers provides a well rounded service but doesn't excel in many aspects. Their fees are average, and so is their account opening process, research and customer service. Their educational tools are high quality and numerous, and their trading platforms are well designed. One of the biggest things in the favour of Interactive Brokers is their rage of funds, which is second only to Swissquote.

Interactive Brokers Overall Rating

BrokerChooser Rating: 4.9/5.0

Client Specific Rating: 4.2/5.0

All of the above factors contribute to Interactive Brokers receiving a strong score of 4.2/5.0 in suitability for the client. This is largely due to the superior safety of other brokers.

Interactive Brokers Score Summary Table

Factor	BrokerChooser Score (/5)	Client Specific Score (/5)	Weight	Weighted Score (Sum/24)
Fees	4.5	4.7	4	3.8
Account Opening	3.2	5.0	2	2.0
Deposit/Withdrawal	3.0	4.7	2	1.9
Trading Platform	3.8	4.2	2	1.7
Markets and Products	5.0	5.0	4	4.0
Research	4.3	4.3	1	0.9
Customer Service	4.3	3.5	3	2.1
Education	4.5	4.5	1	0.9
Safety	N/A	3.0	5	3.0
Total	4.9/5.0	38.9	24	4.2/5.0

3.5.2.1 Fees

Interactive Brokers has average fees for fund trades. The fee for most funds is 3% of the trade value, but capped at 15 USD. This makes it attractive in comparison to Swissquote's fee for trading 'Vanilla Funds', but is higher than the fee for trading with their 'Prime Partners'. Similar to this, Interactive Brokers does offer a selection of fund providers who can be traded with at no cost. Finally, European funds are subject to different fees of 0.1% of the trade value, with a minimum of €4 and a maximum €30.

For an account balance of more than 2,000 USD a monthly inactivity fee of 10 USD is charged. If a commission is generated during the month then the fee is the difference between the two. For an account holder under the age of 25 the inactivity fee is reduced to $3.

Interactive Brokers Fees Rating

BrokerChooser Rating: 4.5/5.0

Client Specific Rating: 4.7/5.0

Since the fee for fund trades is either nothing or 15 USD, and there are no custody fees, Interactive Brokers scores 4.7/5.0 for fees (trading fees were awarded 4.5/5.0 since it varies between the 4 and 5 point categories).

3.5.2.2 Account Opening

The account opening process at Interactive Brokers is fully digital and verification is relatively fast, overall taking approximately 2 days and a few hours of work.

Interactive Brokers Account Opening Rating

BrokerChooser Rating: 3.2/5.0

Client Specific Rating: 5.0/5.0

Compared to other brokers, the account opening process is relatively smooth and scores 5.0/5.0.

3.5.2.3 Deposit and Withdrawal

Interactive Brokers offers a large range of 21 base currencies (including AUD). Only bank transfer is offered for depositing in most of the world, but Australians can also use BPAY. Bank transfers can take 2–3 days and BPAY can be slightly faster. One withdrawal is provided free of charge per month. Subsequent withdrawals cost 15 AUD when withdrawing in AUD.

Interactive Brokers Deposit and Withdrawal Rating

BrokerChooser Rating: 3.0/5.0

Client Specific Rating: 4.7/5.0

The option of BPAY is nice but ideally the withdrawal process would be slightly faster so 0.3 points have been deducted.

3.5.2.4 Trading Platform

Interactive Brokers has a user-friendly and intuitive web client which offers two-factor authentication. Unfortunately the platform is not customisable at all.

The Desktop client is only accessible to advanced traders and the mobile app is feature rich but not so user-friendly or visually appealing.

Interactive Brokers Trading Platform Rating

BrokerChooser Rating: 3.8/5.0

Client Specific Rating: 4.2/5.0

Though all platforms are available, the desktop platform is only accessible to advanced traders so full points were not awarded. This fact, combined with the imperfect quality of the platforms, results in an overall score of 4.2/5.0.

3.5.2.5 Markets and Products

Interactive Brokers has an extremely wide range of markets and products and their selection of 400 fund providers gives us access to an impressive 46,000+ funds.

Interactive Brokers Markets and Products Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 5.0/5.0

As the broker with the largest amount of available funds, Interactive Brokers achieves a perfect score of 5.0/5.0.

3.5.2.6 Research

An Interactive Brokers account comes with a wide range of high quality research tools and access to resources from third party providers but accessing these tools is not user friendly.

Interactive Brokers Research Rating

BrokerChooser Rating: 4.3/5.0

Client Specific Rating: 4.3/5.0

There is no reason to disagree with BrokerChooser's rating of 4.3/5.0.

3.5.2.7 Customer Service

Customer service is available by phone, live chat and email, however phone service is only available in the early morning in Australia from 00:30 to 10:00 on weekdays. Despite this, the quality of the service is high.

Interactive Brokers Customer Service Rating

BrokerChooser Rating: 4.3/5.0

Client Specific Rating: 3.5/5.0

The availability of all channels and high quality of service are good, but the opening hours are quite bad. Considering this, only 0.5/2.0 points are awarded for quality/hours and 3/3 for the availability of all channels results in a score of 3.5/5.0.

3.5.2.8 Education

Interactive brokers has a large range of educational resources including webinars, news, educational videos and tutorials on using their platform. Some of these may prove useful and all are nice to have.

Interactive Brokers Education Rating

BrokerChooser Rating: 4.5/5.0

Client Specific Rating: 4.5/5.0

There is no reason to disagree with the score of 4.5/5.0.

3.5.2.9 Safety

Banking License – Interactive Brokers do not hold a banking license.

Stock Exchange – They are listed on the NASDAQ as IBKR.

Regulators – They are regulated by multiple top-tier financial authorities, like the US Securities and Exchange Commission (SEC) and the UK Financial Conduct Authority (FCA).

Cash Guarantee – Australians do not receive a cash guarantee through this broker.

History – Interactive Brokers is based in the USA and was founded in 1978. Despite multiple economic crises, they have remained in the brokerage market, which is a good sign for their safety.

Interactive Brokers Safety Rating

BrokerChooser Rating: N/A

Client Specific Rating: 3.0/5.0

Interactive Brokers performance in the above 5 areas contribute to a score for safety of 3.0/5.0, it would be ideal if they had a banking license and offered a cash guarantee, but other authorities still hold them to high standards.

3.5.2.10 Conclusion

Interactive Brokers offers the largest selection of funds of any broker. Their account opening, and deposit and withdrawal processes are excellent, and their performance most of the remaining categories is decent. Unfortunately their safety is lacking, as no banking license is held, and Australians are ineligible for any cash guarantee. This results in an overall score of 4.2/5.0.

3.5.3 Vanguard

Summary – Vanguard's brokerage service is suitable for the client in many ways. They have a wide selection of ETFs and mutual funds, and a simple account opening process. While their trading platforms are decent, they are somewhat lacking in safety compared to other brokers, which causes a considerable decrease in their score. Their process for deposit and withdrawal is also somewhat of a weakness.

Vanguard Overall Rating

BrokerChooser Rating: 4.5/5.0

Client Specific Rating: 3.7/5.0

With their attractive fee structure and competitive selection of markets and products, Vanguard achieves an overall score of 3.7/5.0.

Vanguard Score Summary Table

Factor	BrokerChooser Score (/5)	Client Specific Score (/5)	Weight	Weighted Score (Sum/24)
Fees	4.3	5.0	4	4.0
Account Opening	4.2	5.0	2	2.0
Deposit/Withdrawal	2.4	1.6	2	0.6
Trading Platform	3.4	3.5	2	1.4
Markets and Products	2.7	4.3	4	3.4
Research	3.0	3.0	1	0.6
Customer Service	4.5	3.5	3	2.1
Education	3.5	3.5	1	0.7
Safety	N/A	3.0	5	3.0
Total	4.5/5.0	32.4	24	3.7/5.0

3.5.3.1 Fees

Vanguard presents a competitive fee structure with zero fees for ETFs, for Vanguard's own mutual funds, and for 3,000 other non-Vanguard funds. Trading funds that are not in this group of 3,000 costs a flat fee of 20 USD, however accounts with more than $1 million invested in Vanguard funds get between 25 and 100 trades for free.

Vanguard does not charge inactivity or account fees unless you are signed up for mailed paperwork. The low fees for funds and non-existent custody fee and low fund fees contribute to a perfect score in this category.

Vanguard Fees Rating

BrokerChooser Rating: 4.3/5.0

Client Specific Rating: 5.0/5.0

Funds and ETFs can either be traded for free, or come with a maximum fee of 20 USD. This awards them the maximum score for fund trading fees. The absence of a custody or account fee is also a point of differentiation. As a result Vanguard's fees qualify for a perfect score of 5.0/5.0

3.5.3.2 Account Opening

Vanguard's account opening process is fully digital, with the online application taking around 15 minutes, and the verification process taking around 3 days.

Vanguard Account Opening Rating

BrokerChooser Rating: 4.2/5.0

Client Specific Rating: 5.0/5.0

Vanguard's account opening process recieves a perfect score of 5.0/5.0, since it is fully digital and should be completed in fewer than 5 days. This means no deductions are made from Vanguard's score in this category.

3.5.3.3 Deposit and Withdrawal

Vanguard's deposit and withdrawal options are limited. The only currency they offer for withdrawals is USD, and the only available method for withdrawal is bank transfer. Withdrawals take a couple of days to process and the deposit and withdrawal procedure is relatively straightforward.

Vanguard Deposit and Withdrawal Rating

BrokerChooser Rating: 2.4/5.0

Client Specific Rating: 1.6/5.0

Vanguard loses some significant points here for only offering a single currency and specifically for not offering AUD. They score 1/2 for only offering a single method of withdrawal, and for the duration and complexity of the process they are scored 0.5/1. This gives Vanguard a total score of 1.6/5.0 for fees.

3.5.3.4 Trading Platform

Vanguard offers both web and mobile trading platforms, however they do not offer a desktop app. Their web platform is average, with a design that clearly presents important data, but lacks customisation options and hides certain features in unexpected locations.

Their mobile trading platform is better, with a more user friendly interface, and the option to use multi-factor authentication. Trading of certain securities is unavailable on the mobile platform, and applications from other brokers are better at sending alerts, but overall the mobile platform is decent.

Vanguard Trading Platform Rating

BrokerChooser Rating: 3.4/5.0

Client Specific Rating: 3.5/5.0

Vanguard scores one point for each of the two platforms they offer, and scores 1.5/2.0 for the quality of their platforms. This gives them a total score of 3.5/5.0 for their trading platforms.

3.5.3.5 Markets and Products

Vanguard offers funds from 344 fund providers (including Vanguard itself). The actual amount of funds they offer from other companies couldn't be found, however they offer 431 of their own.

Vanguard Markets and Products Rating

BrokerChooser Rating: 2.7/5.0

Client Specific Rating: 4.3/5.0

Since the total amount of funds couldn't be found, Vanguard will be compared to the amount of *fund providers* that Interactive Brokers offer. IB offers funds from 400 providers, therefore Vanguard achieves a score of $\frac{344}{400} = 4.3/5.0$ in this category.

3.5.3.6 Research

Vanguard provides some standard research options in the form of a news feed, data/charts, and trading ideas provided by third parties. Their charting and data visualisation tools are limited in functionality, and they are lacking some research functionality offered by other brokers.

Vanguard Research Rating

BrokerChooser Rating: 3.0/5.0

Client Specific Rating: 3.0/5.0

BrokerChooser's rating of 3.0/3.0 was considered appropriate and did not need to be changed to accomodate the needs of the client.

3.5.3.7 Customer Service

Vanguard offers high quality customer service both over the phone and via. email. The quality of the provided support is good, and response times via. email are usually within a day or two. They do not, however, offer support by live chat, nor is their service 24/7 (instead operating between 8am and 8pm American Eastern Time).

Vanguard Customer Service Rating

BrokerChooser Rating: 4.5/5.0

Client Specific Rating: 3.5/5.0

Vanguard scores one point for each of their two available customer service channels and 1.5/2 points for the quality and convenience of the service. While the quality of support is said to be high, the operating hours are not ideal for an investor based in Australia.

3.5.3.8 Education

Vanguard offers some good quality educational articles and videos, as well as interactive webinars. Unfortunately they do not offer features like a demo account, and the resources for learning about how to use their trading platform are limited.

Vanguard Education Rating

BrokerChooser Rating: 3.5/5.0

Client Specific Rating: 3.5/5.0

BrokerChooser's rating of 3.5/5.0 is considered appropriate.

3.5.3.9 Safety

Banking License – Vanguard does not hold a banking licence and is therefore not bound by the strict reporting requirements that banks are.

Stock Exchange – Vanguard is also not listed on a stock exchange.

Regulators – They are, however, regulated by both the Securities and Exchange Commission and the Financial Industry Regulatory Authority (FINRA).

Cash Guarantee – Vanguard customers are provided with a high level of cash guarantee under the US investor protection scheme (SIPC). This shields investors from losses of up to 500,000 USD, including up to $250,000 in cash, which is significantly better than most brokers.

History – Vanguard began to offer brokerage services in 1983.

Vanguard Safety Rating

BrokerChooser Rating: N/A

Client Specific Rating: 3.0/5.0

Vanguard recieves full points in 3 categories for being regulated by reputable institutions, providing a strong cash guarantee, and being well established. They lose 2 points in their safety rating for not holding a banking licence or being listed on a stock exchange.

3.5.3.10 Conclusion

Vanguard offers a competitive brokerage service in many areas. Their selection of ETFs and mutual funds is very good, their fees are highly competitive, and their account opening process is painless. They do however fall behind in a few areas. Their deposit and withdrawal process offers relatively few options, especially for currencies, and their safety rating is less than ideal as they do not hold a banking licence and are not listed on a stock exchange. Their overall score of 3.7 is considered appropriate.

3.5.4 TradeStation

Summary – TradeStation has reasonable fees and a decent range of fund providers. Their research and educational tools are good, but customer service is lacking. There is a reasonably good level of safety.

TradeStation Overall Rating

BrokerChooser Rating: 4.7/5.0

Client Specific Rating: 3.5/5.0

Overall, TradeStation deserves a score of 3.5/5.0 in suitability for the client.

TradeStation Score Summary Table

Factor	BrokerChooser Score (/5)	Client Specific Score (/5)	Weight	Weighted Score (Sum/24)
Fees	4.1	4.7	4	3.8
Account Opening	5.0	5.0	2	2.0
Deposit/Withdrawal	2.2	3.2	2	1.3
Trading Platform	3.8	3.8	2	1.5
Markets and Products	3.2	0.2	4	0.2
Research	4.3	4.3	1	0.9
Customer Service	4.0	3.3	3	2.0
Education	5.0	5.0	1	1.0
Safety	N/A	4.0	5	4.0
Total	4.7/5.0	33.5	24	3.5/5.0

3.5.4.1 Fees

TradeStation has average fees for fund trades at a flat rate of 15 USD. They have an inactivity fee of 50 USD each year if less than 5 trades are made and an unfortunately high withdrawal fee of 35 USD.

TradeStation Fees Rating

BrokerChooser Rating: 4.1/5.0

Client Specific Rating: 4.7/5.0

TradeStation scores 4.7/5.0 for fees for the same reasons as Interactive Brokers.

3.5.4.2 Account Opening

TradeStation has a fast, user-friendly account opening process, being fully digital and having relatively fast verification times of approximately a day.

TradeStation Account Opening Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 5.0/5.0

This process is deserving of BrokerChooser's perfect score. 5.0/5.0.

3.5.4.3 Deposit and Withdrawal

TradeStation offers a decent range of 19 base currencies including AUD. They have quite a high withdrawal fee of 35 USD but no deposit fee. Bank Transfer is the only available payment method.

TradeStation Deposit and Withdrawal Rating

BrokerChooser Rating: 2.2/5.0

Client Specific Rating: 3.2/5.0

According to the client's rating system TradeStation is scored at a 3.2. They were scored only 0.2/1 point for 'complexity and cost'.

3.5.4.4 Trading Platform

TradeStation offers a user-friendly and nice looking web and mobile platform. The web platform is appropriately customisable and fees are made transparent. The desktop client is unfortunately only suitable for advanced traders.

TradeStation Trading Platform Rating

BrokerChooser Rating: 3.8/5.0

Client Specific Rating: 3.8/5.0

TradeStation's web platform is awarded half points considering it will not be valuable to the client, and small deductions for quality result in a score of 3.8/5.0.

3.5.4.5 Markets and Products

TradeStation has an moderate selection of funds available, they offer at least 2,000 funds from 55 fund providers, including many of the large names, but this is significantly less than some other brokers.

TradeStation Markets and Products Rating

BrokerChooser Rating: 3.2/5.0

Client Specific Rating: 0.2/5.0

TradeStation scores 0.2/5.0 ($\approx \frac{2{,}000}{46{,}000}$) due to their limited selection of funds.

3.5.4.6 Research

Research materials are high quality and accessible to all types of investors, unfortunately some of the research tools can only be accessed through the desktop client, which is not a good option for many users. A lot of TradeStation's research tools are also not free.

TradeStation Research Rating

BrokerChooser Rating: 4.3/5.0

Client Specific Rating: 4.3/5.0

BrokerChooser's score of 4.3/5.0 is suitable for the client.

3.5.4.7 Customer Service

TradeStation has reasonably good phone and email support, which is unfortunately only available on weekdays between 10pm and 10am AEST. BrokerChooser claims the live chat doesn't work but this seems to have changed and the chat appears to be available during the same hours.

TradeStation Customer Service Rating

BrokerChooser Rating: 4.0/5.0

Client Specific Rating: 3.3/5.0

TradeStation's support is open overnight in Australia so they receive only 0.3/2.0 for convenience/quality. Since all 3 channels seem to be available despite BrokerChooser's assessment, TradeStation's customer service receives a 3.3/5.0.

3.5.4.8 Education

TradeStation's educational material is great. It offers many high quality tools including a demo account, educational videos, and news articles. There is also a set of tutorials on using their platform optimally, which is nice to have.

TradeStation Education Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 5.0/5.0

They are deserving of the perfect score in this category.

3.5.4.9 Safety

Banking License – TradeStation does not have a banking licence.

Stock Exchange – Their parent company, Monex Group, is listed on the Tokyo stock exchange.

Regulators – TradeStation is regulated by the Securities and Exchange Commission (SEC), and the Financial Industry Regulatory Authority (FINRA).

Cash Guarantee – All clients are entitled to 500,000 USD of financial protection.

History – TradeStation was established in 1982.

TradeStation Safety Rating

BrokerChooser Rating: N/A

Client Specific Rating: 4.0/5.0

TradeStation's performance in the above 5 areas contribute to a score for safety of 4.0/5.0.

3.5.4.10 Conclusion

TradeStation's flat rate fees on fund trades and educational tools are great, and their research tools are also better than many of the other brokers. Their customer service is open at an unfortunate time for a client based in Australia and their selection of mutual funds is quite small. This is a shame because TradeStation offers a decent amount of security meaning they could be considered if they offered more funds. Overall TradeStation is awarded a 3.5/5.0 score.

3.5.5 Saxo Bank

Summary – Saxo Bank offers many exceptional services, their trading platforms are excellent and receive a perfect score, and their research tools, educational tools, and customer service are all excellent. Unfortunately they fall short on one of the most important criteria, offering only an extremely small range of mutual funds.

In addition to this, there is a substantial fee if trades are not made frequently, and the level of security they offer could be better. Saxo Bank is not listed on a stock exchange, nor do they provide a cash guarantee to Australian investors.

Saxo Bank Overall Rating

BrokerChooser Rating: 4.8/5.0

Client Specific Rating: 3.6/5.0

Overall Saxo Bank receives a score of 3.6/5.0 which would be significantly improved if they offered a larger selection of funds.

Saxo Bank Score Summary Table

Factor	BrokerChooser Score (/5)	Client Specific Score (/5)	Weight	Weighted Score (Sum/24)
Fees	3.0	5.0	4	4.0
Account Opening	4.3	5.0	2	2.0
Deposit/Withdrawal	4.8	4.8	2	1.9
Trading Platform	5.0	5.0	2	2.0
Markets and Products	5.0	0.5	4	0.4
Research	5.0	5.0	1	1.0
Customer Service	4.5	3.8	3	2.3
Education	4.5	4.5	1	0.9
Safety	N/A	3.0	5	3.0
Total	4.8/5.0	36.6	24	3.6/5.0

3.5.5.1 Fees

Generally Saxo Bank offers average trading and non-trading fees, a large advantage is that they have no fee on trading mutual funds. For non-UK residents there is an inactivity fee of 100 USD for every 6 months of inactivity. There is also a custody fee of 0.25% annually but luckily this does not apply to mutual funds.

Saxo Bank Fees Rating

BrokerChooser Rating: 3.0/5.0

Client Specific Rating: 5.0/5.0

Since funds are exempt from so many fees with Saxo Bank they score a perfect 5.0/5.0.

3.5.5.2 Account Opening

Saxo has a fully digital account opening process. Registering on the site only takes 15 minutes but the verification may take a few days. The minimum deposit of 3,000 GBP is not an issue but Platinum and VIP accounts are only offered for deposits upward of 200,000 GBP.

Saxo Bank Account Opening Rating

BrokerChooser Rating: 4.3/5.0

Client Specific Rating: 5.0/5.0

BrokerChooser's score seems a bit low and has been increased to 5.0/5.0 as it meets all the needs of the client.

3.5.5.3 Deposit and Withdrawal

Deposit and withdrawal are free and available in 26 currencies. Deposits can be made by credit/debit card as well as bank transfer, which is not so common.

Saxo Bank Deposit and Withdrawal Rating

BrokerChooser Rating: 4.8/5.0

Client Specific Rating: 4.8/5.0

Considering the currencies and channels available BrokerChooser has provided an appropriate rating here.

3.5.5.4 Trading Platform

Saxo Bank has excellent web, mobile and desktop clients. All have a modern design, offer excellent functionality and work without bugs. The web and desktop clients are easily customisable to display relevant information.

Saxo Bank Trading Platform Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 5.0/5.0

Saxo's trading platforms receive no deductions and are deserving of the perfect score.

3.5.5.5 Markets and Products

Saxo Bank offers a wide range of products that cover a lot of markets. Unfortunately, their selection of mutual funds is quite weak in comparison to alternatives such as Swissquote or Interactive Brokers. They offer around 5,000 funds from a small amount of providers, however not all of these are available to customers in all regions.

This is a considerable disadvantage of Saxo Bank, as apart from this their platform and fee structure is well suited to the needs of the client.

Saxo Bank Markets and Products Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 0.5/5.0

Saxo Bank receives only a 0.5/5.0 ($\approx \frac{5{,}000}{46{,}000}$) because of their limited selection of funds.

3.5.5.6 Research

Saxo provides very good information on a small range of products, unfortunately a lot of their research tools can only be accessed with a subscription to their tools. Without subscribing a user still gets access to a news feed and an excellent selection of charts and data.

Saxo Bank Research Rating

BrokerChooser Rating: 5.0/5.0

Client Specific Rating: 5.0/5.0

There is nothing to suggest that BrokerChooser's perfect score should be reduced.

3.5.5.7 Customer Service

Saxo Bank offers support via phone and email, there is no option for live chat which is a drawback. Phone support is available in many countries including Australia meaning that support can be accessed during business hours on weekdays.

Saxo Bank Customer Service Rating

BrokerChooser Rating: 4.5/5.0

Client Specific Rating: 3.8/5.0

Saxo is one of the few brokers to provide support during the day in Australia, and the high quality means they get a score of 1.8/2.0 for convenience/quality and 2.0/3.0 for the channels available. This results in a total score of 3.8/5.0.

3.5.5.8 Education

Saxo offers a range of educational videos, webinars, and tutorials on using their platform. These are all nice to have, especially tutorials specific to using their platform.

Saxo Bank Education Rating

BrokerChooser Rating: 4.5/5.0

Client Specific Rating: 4.5/5.0

BrokerChooser's rating of 4.5/5.0 is appropriate.

3.5.5.9 Safety

Banking License – Saxo Bank has a Danish banking license, and as such it is subject to tougher regulations than many brokers.

Stock Exchange – They are not listed on a stock exchange.

Regulators – Saxo Bank is regulated by several financial authorities, like the Danish Financial Services Agency (FSA), the Financial Conduct Authority (FCA), or the Swiss Federal Banking Commission

Cash Guarantee – Australians are unfortunately not entitled to any financial protection through Saxo.

History – Saxo Bank is based in Denmark and was founded in 1992.

Saxo Bank Safety Rating

BrokerChooser Rating: N/A

Client Specific Rating: 3.0/5.0

Saxo Bank's performance in the above 5 areas contribute to a score for safety of 3.0/5.0, it would be nice if they were a publicly listed company and provided Australians with financial protection.

3.5.5.10 Conclusion

Saxo Bank excels in many aspects of this assessment. Their fees, trading platform, deposit and withdrawal processes, research, and educational tools are all great. The two failures of Saxo are their tiny selection of mutual funds and low safety rating, due to the fact that they are a private company and no cash guarantee is offered. This results in an overall score of 3.6/5.0.

3.6 Final Selection

Based on the information in Section 3.5, Swissquote, Interactive Brokers, and Vanguard are all worth considering for the investor described in Section 3.3. This being said, TradeStation and Saxo Bank may be more appropriate for other investors with a different profile. Tables summarising the performance of the top 3 in the BrokerChooser and Client scoring systems are presented below.

Out of these options, Swissquote seems most appropriate. This is because they manage to perform well on all criteria they were assessed on, offering an extremely compelling level of safety and a large selection of mutual funds. The fact that both of these categories are considered highly important by the client of the report make Swissquote the obvious choice.

As shown in the summary tables below, Interactive Brokers also offers a high quality platform, and a fee structure for funds that is somewhat better than Swissquote's. The set of mutual funds they offer is larger than Swissquote's, however both offer almost all major funds. Unfortunately Interactive Brokers do not hold a banking licence, nor do they offer any cash guarantee to Australians. Because of this, Swissquote is a better option, however Interactive Brokers remains a highly competitive alternative.

In third place is Vanguard, which also presents a more attractive fee structure than Swissquote, but again falls behind in safety. Vanguard also has a larger selection of funds than Swissquote, but again Swissquote already offers the vast majority of competitive funds. In addition to their imperfect safety, Vanguard could improve their score by offering better options for deposit and withdrawal. Their inability to process transactions in currencies other than USD is a considerable disadvantage, and they could also offer alternative methods to bank transfer for convenience.

Beyond the top 3 other options may be suitable for different investors depending on their circumstances. For the commissioner of this report both TradeStation and Saxo Bank have large enough drawbacks that it isn't worth considering them over these superior options for mutual fund trading from Australia.

Swissquote Score Summary Table

Factor	BrokerChooser Score (/5)	Client Specific Score (/5)	Weight	Weighted Score (Sum/24)
Fees	1.8	5.0	4	4.0
Account Opening	4.0	5.0	2	2.0
Deposit/Withdrawal	4.6	4.5	2	1.8
Trading Platform	4.3	3.8	2	1.5
Markets and Products	5.0	3.2	4	2.6
Research	3.3	3.3	1	0.7
Customer Service	5.0	4.0	3	2.4
Education	5.0	5.0	1	1.0
Safety	N/A	5.0	5	5.0
Total	4.5/5.0	38.8	24	4.4/5.0

Interactive Brokers Score Summary Table

Factor	BrokerChooser Score (/5)	Client Specific Score (/5)	Weight	Weighted Score (Sum/24)
Fees	4.5	4.7	4	3.8
Account Opening	3.2	5.0	2	2.0
Deposit/Withdrawal	3.0	4.7	2	1.9
Trading Platform	3.8	4.2	2	1.7
Markets and Products	5.0	5.0	4	4.0
Research	4.3	4.3	1	0.9
Customer Service	4.3	3.5	3	2.1
Education	4.5	4.5	1	0.9
Safety	N/A	3.0	5	3.0
Total	4.9/5.0	38.9	24	4.2/5.0

Vanguard Score Summary Table

Factor	BrokerChooser Score (/5)	Client Specific Score (/5)	Weight	Weighted Score (Sum/24)
Fees	4.3	5.0	4	4.0
Account Opening	4.2	5.0	2	2.0
Deposit/Withdrawal	2.4	1.6	2	0.6
Trading Platform	3.4	3.5	2	1.4
Markets and Products	2.7	4.3	4	3.4
Research	3.0	3.0	1	0.6
Customer Service	4.5	3.5	3	2.1
Education	3.5	3.5	1	0.7
Safety	N/A	3.0	5	3.0
Total	4.5/5.0	32.4	24	3.7/5.0

3.7 Conclusion

In this section Swissquote was identified as the most appropriate broker for the client of this report. Based on research in previous chapters and according to the profile of the client in Section 3.3, it is known that the client is looking at investments in managed funds, and this is an area in which Swissquote excels.

The following chapter will follow on from this and look specifically at *which* mutual funds and ETFs will be most appropriate for investment. In particular, the question of whether the client is best served by actively or passively managed funds will be addressed. For this, a system for comparing funds is developed, and a shortlist of the most appropriate funds is presented.

Chapter 4

Fund Selection

In this chapter specific investment options are identified for the client. First, general requirements that the client has for any investment are outlined, then, focusing specifically on mutual funds, the best available options are identified. This will be done using a ranking system that is customised to the needs of the client defined in Section 3.3. A similar process will then be undertaken for ETFs. Finally, the performance of the mutual funds will be compared with the ETFs in order to make final recommendations for the client's portfolio.

4.1 General Requirements

Before looking in detail at either mutual funds or ETFs it is worth considering some fundamental requirements that the client has for any fund-type investment. These are applicable to both mutual funds and ETFs, and are emphasized here as these properties will be referenced in both of the fund selection sections. There are 3 such requirements, presented in sections 4.1.1 through 4.1.3.

4.1.1 Accumulation vs. Distribution Funds

In Section 1.2.1 the concept of *accumulation* and *distribution* funds was introduced. In general, mutual funds are offered in both accumulation and distribution variants. As a long-term hands-off investor, the client has expressed a preference for accumulation funds. As such, distribution funds should be excluded at the beginning of the selection process.

This will be relevant in sections 4.2 and 4.3, where a considerable amount of mutual funds are eliminated for the fact they distribute income.

4.1.2 Historical Performance Thresholds

Secondly, any mutual funds that have performed worse than the Nasdaq Composite index over the last 10 years are excluded. In Chapter 2 it was identified that this index, tracking the securities listed on the Nasdaq stock exchange, was the best performing index fund over the past few decades. Mutual funds that have been outperformed by this index are excluded since the Nasdaq Composite Index is itself a viable and robust investment option that could be recommended to the client over any worse performing mutual fund.

Since the Nasdaq provided an average return of 12.9% between 2012 and 2022, any mutual funds performing below this threshold will be discarded. When considering ETFs, the threshold is set at 12.9%, and for mutual funds, since active management introduces some additional risks, the threshold has instead been set at 14%. This 1.1% increase represents the additional return that is expected for risking an investment on the decisions of the fund manager, and under different market conditions it may be necessary to select different thresholds here.

Applying these thresholds to the actual fund selection process requires careful consideration however, as different funds are reported in different currencies. This needs to be accounted for before comparing performance figures. This problem, and the steps used to manage it in both the mutual fund and ETF selection processes are presented in more detail in the following section.

4.1.2.1 Managing the Foreign Exchange Effect

Mutual fund managers select securities to put into an actively managed fund in order to beat their benchmark. They then present the same selection of securities to clients in different jurisdictions in the client's local domestic currencies to make them attractive as investments. This means that a USA technology fund comprising US-based tech companies will be offered to US clients in US Dollars, but may also be offered to European clients in Euros.

Over time, if the US dollar and Euro currencies remain equal in foreign exchange terms then the percentage returns will be the same in both currencies. However, if the USD strengthens relative to the Euro then the Euro percentage performance results will look better when looked at in the Euro currency than the US Dollar version.

For example, over the last 10 years the Euro has weakened approximately 2.2% p.a. relative to the US dollar. Because of this, a fund denominated in Euros will show a 10 year percentage return of 2.2% p.a. higher than the same fund reported in US Dollars. Clearly, before direct comparisons can be made between funds in different currencies, this foreign exchange (FX) effect needs to be accounted for.

To do this, the cross-rate foreign exchange variations must be investigated for all the key currencies for each of the 1, 3, 5, and 10 year periods, and FX adjustment factors must be calculated and used to normalise the result before direct comparisons can take place. A sample of these adjustment factors as calculated on 21/01/2024 can be found in Table 4.1.

Table 4.1: Annualised Percentage FX adjustment factors as recorded on 21/01/2024.

	USD	**EUR**	**GBP / GBX**	**CHF**	**JPY**
1 Year	0.0	-0.4	-2.5	-5.6	15.3
3 Year	0.0	3.6	2.4	-0.8	12.7
5 Year	0.0	0.9	0.3	-2.7	6.2
10 Year	0.0	2.2	2.7	-0.3	3.5

Note: 1 GBP = 100 GBX

From this information, it is clear that in order to get a 10 year return greater than or equal to 14% p.a. in US Dollars from funds in other currencies, the following performance hurdles must be met. In Euros, the required per annum return is $14 + 2.2 = 16.2\%$, in Pounds $14 + 2.7 = 16.7\%$, in Swiss Francs $14 - 0.3 = 13.7\%$, and in Japanese Yen $14 + 3.5 = 17.5\%$.

When performing mutual fund and ETF selection, these currency-specific hurdles will be used to eliminate all funds that have performed worse than the Nasdaq in terms of annualised return over the last 10 years all benchmarked in US Dollars. This considerably reduces the amount of funds in the dataset, and ensures that only funds with a history of extremely competitive returns are retained.

The adjustment figures will also be applied before the scoring process. By doing this it is guaranteed that all funds present a comparable historical long-term performance figure representing their performance in US Dollars.

4.1.3 Minimum Initial Investments

A final simple requirement that is set for the funds is that their minimum initial investment is not prohibitively large. The client of the report has agreed that this threshold should be set at 1.5 Million USD since they do not want to put more than this sum into any one mutual fund or ETF.

This requires that the minimum initial investment is converted into a USD figure, but this is simple to do with exchange rate data that was collected when adjusting for FX effects.

4.2 Mutual Fund Selection

With the client's general requirements detailed above, this section outlines the methodology and results of the mutual fund selection process. The available resources for acquiring mutual fund data are first investigated, then the process for scoring and selection of funds is described. Based on this system, a list of mutual funds which best meet the preferences of the client are presented at the end of the section.

4.2.1 Mutual Fund Comparison Resources

In order to select mutual funds and ETFs which will be suitable for the long-term investment needs of the client, it is important to be able to compare many attributes over a diverse selection of mutual funds/ETFs. Various resources exist which provide data and professional analysis of mutual funds/ETFs, and the best of these, namely the screening tools from Morningstar, the Financial Times, and Yahoo Finance were each considered as candidates for performing the mutual fund/ETF analysis in this report.

To determine the best resource, it was important to consider:

- The amount of mutual funds/ETFs indexed by each resource,
- How much data is available about each mutual fund/ETF, and
- How complex it will be to download this data in large quantities.

Looking first at the amount of mutual funds/ETFs listed in each database, the most mutual funds/ETFs are indexed by Yahoo Finance, with over 230,000 mutual funds and 50,000 ETFs. Second is the Financial Times, with approximately 155,000 mutual funds, and 9,500 ETFs. Finally Morningstar has the smallest selection of around 66,000 mutual funds, and a mid-size selection of 16,000 ETFs. While this initially presents as a strong argument for Yahoo Finance and the Financial Times, closer examination reveals that the majority of these additional mutual funds are simply other class or currency variants of funds that *are* indexed by Morningstar. Because the mutual fund selection process is robust to these currency and class variants and ultimately retains only one for each fund, this represents a relatively minor issue and is only a small argument in favour of Yahoo Finance and the Financial Times.

While Morningstar has the smallest database of mutual funds, the information they provide about each is much more extensive than the alternatives. Morningstar provides over 100 datapoints about each mutual fund (see Appendix E), where at least 50 will be useful for comparison, ranking, and selection. On top of this the data is generally fairly complete (relatively few missing values) and all this information can be found in a single printable summary, making it fairly easy to extract. While Yahoo Finance provides a similar amount of data, it is scattered throughout many pages on the site, making it quite difficult to retrieve. Finally, the Financial Times provides only a fraction of the information that the other sites do. Notably, both Yahoo Finance *and* the Financial Times use data retrieved *from* Morningstar, such as the Morningstar ratings and Style Box.

On balance, Morningstar is the leading provider of mutual fund data, and the consolidated way that this data is presented for each fund makes Morningstar (specifically Morningstar UK – `https://morningstar.co.uk/`) the clear choice for a mutual fund comparison resource. While the set of funds in their database is the smallest, it still contains the vast majority of the best performing and largest mutual funds, which will be sufficient to find good options for the client.

4.2.2 Overview of Scoring and Selection Methodology

The process of identifying the best mutual funds for the client's portfolio now proceeds in 3 stages. The first is preprocessing and preselection, which begins with the entire database of approximately 66,000 mutual funds offered by Morningstar, and eliminates any options that would never be considered as investments based on the general requirements outlined in Section 4.1. This stage narrows the search to 197 mutual funds, for which detailed information is then retrieved. More details about the preprocessing and preselection process are presented in Section 4.2.3.

Following this, in Section 4.2.4, the detailed statistics harvested from Morningstar are used in an automatic scoring process. This process generates scores for various attributes of each mutual fund, like their historical performance and inception date. These scores are then added up, and the total is used to rank the 197 funds in order of their perceived suitability for the client.

Finally, after the ranking process is applied, some manual post-processing steps are required to generate a final list of recommended mutual funds. This takes place in Section 4.2.6. During the post-processing stage, mutual funds that appear in multiple currencies or classes are identified, and only the most desirable combination of class and currency is retained for each fund. The highest scoring mutual funds in the de-duplicated list can then be investigated manually to produce a final set of recommendations.

4.2.3 Preprocessing and Preselection

This stage starts with Morningstar's entire database of 66,000 mutual funds, and narrows this down by applying the general requirements outlined in Section 4.1.

Of Morningstar's 66,000 mutual funds, approximately 45,000 of these are accumulation funds, and the remaining 21,000 are distribution funds (see Section 1.2.1 where it is explained that most funds are offered in both accumulation and distribution variants, and that these are identical except for the treatment of dividends payable). As mentioned in Section 4.1.1, distribution funds will be excluded. This narrows the search to the ∼45,000 accumulation funds.

Following this, any mutual funds with a minimum initial investment greater than 1.5 million USD can be removed. The performance thresholding process discussed in Section 4.1.2 then begins. In this step, a hurdle rate on the 10 year performance of the funds is established, which ensures that options that have performed worse than the Nasdaq over the last decade are eliminated. Clearly if a mutual fund does not beat the Nasdaq then there is little point in choosing it for investment, instead one would simply invest in a Nasdaq index.

Using the currency adjusted thresholds described in Section 4.1.2.1 any mutual funds with an annualised, 10 year, US Dollar performance below 14% are eliminated. This reduces the set of 45,000 funds to only 197. Of

this 197, 144 are denominated in USD, 23 in Euros, 4 in Swiss Francs, 15 in GBP, 9 in GBX, and 2 in Japanese Yen.

Complete data for these 197 mutual funds is now automatically collected from Morningstar. This includes 48 attributes about each fund's performance. These attributes will be used for comparison in the automatic scoring process that is detailed in the following section.

4.2.4 Automatic Scoring and Ranking Process

At this stage the dataset now contains 197 mutual funds that exceed their currency adjusted 14% USD hurdle rate, but still includes multiple currencies and classes. These need to be scored and ranked in order of preference based on the available data from Morningstar, which provides the total of 48 attributes listed in Appendix G.

To begin this process, the mutual fund data is first divided into three groups. Appendix G.1 lists the 25 attributes of a mutual fund which are considered appropriate for use in an automatic scoring process (e.g. 10 year annualised return). Appendix G.2 contains the list of 9 attributes which are considered valuable for the selection process, but require more nuanced consideration, and are therefore thought to be more appropriate for a manual selection process (e.g. manager start date). Finally Appendix G.3 contains the set of 14 attributes which are collected for informational purposes only (e.g. the fund name), and will not be used in the fund selection process (note that $25 + 9 + 14 = 48$ attributes in total).

The remainder of this section focuses on the *automatic* scoring and ranking process, which looks at each remaining mutual fund in the dataset of 197 funds and generates 23 Scores based on the 25 attributes listed in Appendix G.1. These Scores are based on the statistics provided by Morningstar, and the 23 Scores have been divided into the following 11 groups. This is done based on which statistics exhibit comparable values, have the same scoring functions, and are reported in the same units. The groups are annotated with the details of their member attributes where appropriate:

Group 1: Fund Size

Group 2: Inception Date

Group 3: Total/Annualised Returns (1 year / 3 years / 5 years / 10 years)

Group 4: Return Relative to Category (1 year / 3 years / 5 years / 10 years)

Group 5: Return Relative to Category Index (1 year / 3 years / 5 years / 10 years)

Group 6: Morningstar Ratings (3 years / 5 years / 10 years / Overall)

Group 7: Ongoing Charge

Group 8: Morningstar Medalist Rating

Group 9: 3Y Sharpe Ratio

Group 10: 3Y Alpha

Group 11: 3Y Beta

In the following sections (4.2.4.1 through 4.2.4.11), the scoring functions for each group are presented. Where multiple attributes exist within a group (e.g. the Total/Annualised Returns group contains 1, 3, 5, and 10 year statistics) an intra-group weight is defined to balance the relative importance of the different member attributes. This provides the flexibility to, for example, assign more weight to measurements that are based on 10 years of past performance than is assigned to 1 year statistics. Groups with only one member attribute do not require intra-group weighting.

Once scoring functions are defined for all groups, and intra-group weights are defined for groups with multiple member attributes, *inter*-group weights are defined in Section 4.2.4.13 to balance the relative contribution of each group to the total score for each fund. The total score is then calculated, and weights are iterated upon in collaboration with the client until the final scoring system is reached.

4.2.4.1 Group 1: Fund Size

A fund's size can be considered a representation of the public perception of the investability of the fund. It follows logically that a large fund has significant support, and therefore should be considered more favourably.

Scoring Function for Fund Size

The fund size (in US millions) is awarded points according to

$$\text{Unweighted Fund Size Score} = 6 \times (\log_{10}(\texttt{fund size (M)}) - 2.7)$$

This rewards funds for having a large size and penalises any funds with a size of less than approximately \$500 Million. The $\log_{10}$ of the fund size is used to avoid rewarding extremely large funds too heavily.

To give some examples, a fund with a size of:

\$100,000,000 USD is scored $6 \times (\log_{10}(100) - 2.7) = -4.2$,

\$500,000,000 USD is scored $6 \times (\log_{10}(500) - 2.7) \approx 0.0$,

\$1,000,000,000 USD is scored $6 \times (\log_{10}(1,000) - 2.7) = 1.8$,

\$10,000,000,000 USD is scored $6 \times (\log_{10}(10,000) - 2.7) = 7.8$,

See Figure 4.1 for a continuous visualisation of the function.

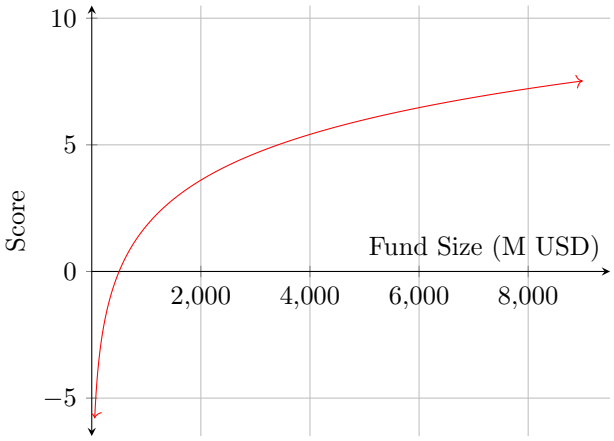


Figure 4.1: A visualisation of the function for scoring fund size.

Since Group 1 contains only 1 attribute (Fund Size) no intra-group weight is required.

4.2.4.2 Group 2: Inception Date

The inception date of a fund is an important indicator of its success over time. Funds that consistently perform at a high level are more likely to remain open than poor performing or highly volatile funds, which are often closed after periods of poor performance because investors have withdrawn their money. Because of this, funds which have existed for a longer amount of time are considered inherently less risky. Additionally, since reporting a 10 year annualised performance figure greater than 14% is a prerequisite for inclusion in our dataset, it is expected that funds will have an inception date prior to 2014.

As a result, the scoring function for fund inception dates rewards funds that have existed for more than 10 years, and provides funds with a more recent inception date no score.

Scoring Function for Inception Date

Any funds with an inception date later than 01/01/2014 receive a score of 0. This is approximately 10 years prior to the date that scoring was conducted. On the other end of the spectrum, funds created before 01/01/1999 (circa 25 years ago) receive the maximum score of 1. At 25 years the fund is considered to have an extensive and reliable history, and only a small set of outliers (16/197) have inception dates prior to 1999. The score for every other fund is set between 0 and 1 by linearly interpolating between those dates. This means that a fund 50% of the way between the two will receive a score of 0.5.

Since Group 2 contains only 1 attribute (Inception Date) no intra-group weight is required.

4.2.4.3 Group 3: Total/Annualised Returns

Some of the most important statistics retrieved from Morningstar are the Total/Annualised Returns of the funds over the past 1, 3, 5, and 10 years. Morningstar provides these performance figures in absolute terms in their `1Y Total Return`, and `3Y/5Y/10Y Annualised Return` statistics.

While past performance can not be considered a reliable indicator of future returns in isolation, the total performance of the fund over the past 10 years is an indicator that the manager and their team have worked well historically. Assuming that the fund manager and staff remain the same, and that trends in the broader economy remain consistent, there is a reasonable chance they will continue to do so in the future. Based on this, a considerable amount of the total score for each fund will be derived from it's performance over the last decade, with an emphasis on the statistics that look further into the past and therefore cover a longer period of time.

Scoring Function for Returns

To generate the scores, the raw percentage numbers are converted into an adjusted statistic that can be used to fairly compare performance across different time periods. To do this, a normalisation process that factors in the mean (μ) and standard deviation (σ) is applied to each of the performance columns. To calculate this score for a given return column x (e.g. `1Y total return`), the mean (μ_x) and standard deviation (σ_x) of the percentage performance values are calculated for that column. To generate the score for a fund, its annualised percentage performance number is taken, the mean is subtracted, and the result is divided by three times the standard deviation.

$$\text{Preliminary Score}_x = \frac{\text{Annualised Percentage Performance}_x - \mu_x}{3\sigma_x}$$

This is applied to all funds in the column, resulting in a new distribution with a mean of 0 and a standard deviation of $\frac{1}{3}$. These scores are then clamped[a] to the range $[-1, 1]$ to reduce the impact of outliers beyond 3 standard deviations from the mean.

[a] Clamping between -1 and 1 sets any values below -1 to -1, and any above 1 to 1.

This process gives us a normalised result for each of the time periods (1 year, 3 year, 5 year and 10 year) for the Total/Annualised Return measure. The question that then needs to be addressed is *what is the relative importance of the 1 year, 3 year, 5 year and 10 year scores?* To address this important question the timeframes of the statistics were considered. Logically, since the 3 year score considers 3 times as much information as the 1 year score, three times as much weight is applied to 3 year statistics. The same logic is applied to the other time periods, meaning that the 1, 3, 5, and 10 year scores are weighted at a relative level of 1:3:5:10. This is the intra-group weighting for Group 3.

4.2.4.4 Group 4: 1Y/3Y/5Y/10Y +/- Category Score

The same process described in Section 4.2.4.3 is applied for scoring this set of attributes. Firstly, a normalisation process for each of the 1Y/3Y/5Y/10Y attributes, followed by a weighting process for the same reasons as described immediately above. This means that the intra-group weighting for the 1, 3, 5, and 10 year +/- Category scores is 1:3:5:10 respectively.

4.2.4.5 Group 5: 1Y/3Y/5Y/10Y +/- Category Index Score

Once again, the same process described in Section 4.2.4.3 is applied for scoring this set of attributes. Firstly, a normalisation process for each of the 1Y/3Y/5Y/10Y attributes, followed by a weighting process for the same reasons as described above. This means that the intra-group weighting for the 1, 3, 5, and 10 year +/- Category Index scores is 1:3:5:10 respectively.

4.2.4.6 Group 6: Morningstar Rating

As seen in the third page of the PDF included in Appendix E:

> *The Morningstar Rating is a rating out of 5 stars based on how well the fund has performed in comparison to similar investments after adjusting for risk and* ***accounting for all fees****. The top 10% of funds receive five stars, the next 22.5% four stars, the middle 35% three stars, the next 22.5% two stars, and the bottom 10% receive one star.*

While the distribution of Morningstar ratings is well-defined according to the above definition, it is important to realise that the funds in our dataset are not a representative sample of Morningstar's database. Because the scoring process preselects for funds with a 10 year annualised performance above 14%, the vast majority of funds in the dataset present Morningstar ratings of 4 or 5 stars. Because of this, the scoring system will not consider 3 stars to be a neutral score in the same way that Morningstar does.

Scoring Function for Morningstar Ratings

Because of the aforementioned bias towards high-performing funds, Morningstar ratings are scored with the same normalised approach as fund returns. This means that for each of the 3Y, 5Y, 10Y, and overall Morningstar rating columns, the mean and standard deviation are calculated, then a preliminary score is calculated by normalising according to:

$$\text{Preliminary Score}_x = \frac{\text{Morningstar Rating}_x - \mu_x}{3\sigma_x}$$

Then outliers outside of the range $[-1, 1]$ are clamped (see Footnote *a*).

Since there are now four normalised attributes in the Morningstar Ratings group, these must be assigned an intra-group weight relative to each other. These weights have been set equal to the amount of time spanned by the Morningstar Rating. This means that the 3 year, 5 year, 10 year, and overall ratings contribute at a ratio of 3:5:10:18 (with the overall rating contributing 18 since it is a weighted average over the 3, 5, and 10 year periods).

4.2.4.7 Group 7: Ongoing Charge

The ongoing charge is an estimate of the expected annual fees one would pay for investing in a fund. For more information see page 6 of Appendix E. By reviewing a large set of funds, the average fee was found to be approximately 1.4%, and in this subset retrieved from Morningstar for scoring, the average is circa 1.2%. Using the statistic from the more representative dataset, 1.4% has been set as the level of ongoing charge that is assigned a benchmark score of 0. The system then rewards funds which have an ongoing charge lower than this, and penalises funds with larger, outdated fee structures.

Scoring Function for Ongoing Charge

The ongoing charge is scored in a way that punishes funds with an annual charge greater than the aforementioned 1.4% and rewards funds below this threshold. The maximum reward before weighting is 1 unit, and the reward for coming in under the 1.4% threshold is set to be twice as much per unit charge than the penalty for exceeding it.

This is because the range of fees below the average (in the 0–1.4% range) is approximately equal to half the range of the charges above (1.4–4.2% in the larger dataset). Therefore, to better differentiate between the funds with lower fees, the scaling factor is increased to amplify the impact of small differences. This also means that the magnitude of the maximum and minimum scores are approximately equal.

Note that the maximum value of 1 unit is arbitrary, since the magnitude of the score is ultimately determined by the inter-group weighting process which will be discussed later.

For an example of the scoring function, a fund with an ongoing charge of 0.7% would receive a score (before scaling) of 0.5, and a charge of 2.1% receives a score of -0.25. A plot of the scoring function is shown in Figure 4.2.

Since Group 7 contains only 1 attribute (Ongoing Charge) no intra-group weight is required.

4.2.4.8 Group 8: Morningstar Medalist Rating

The Morningstar Medalist Rating is the only forward-looking score provided by Morningstar. It is determined by a combination of human and algorithmic analysis of each fund. The score is an estimate of how well the fund is expected to perform **before fees** but after adjusting for risk. If a fund is rated by Morningstar, it receives either a Negative, Neutral, Bronze, Silver, or Gold rating. Of the 197 funds in the data set, 170 receive a Medalist rating, with 21 being Gold, 26 Silver, 45 Bronze, 71 Neutral, and 7 Negative. The remaining 27 have not yet been rated by Morningstar, this is because the process of rating all funds is ongoing.

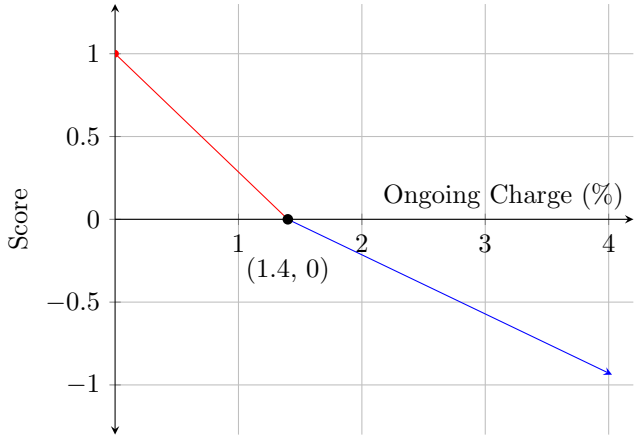


Figure 4.2: A visualisation of the raw score (Y-axis) provided for varying ongoing charges (X-axis).

As the only forward-looking score, the Medalist rating is given considerable weight in the overall (inter-group) scoring process.

Scoring Function for Morningstar Medalist Ratings

Medalist ratings are converted to raw scores according to the mapping defined in Table 4.2. The score for Neutral is set to 0 so that no penalty or reward is applied to these funds, then the scores for Gold, Silver, and Bronze are set at a ratio of 3:2:1 on the basis that there are 3× fewer Gold ratings than Bronze across Morningstar's entire database, and 2× fewer Silver than Bronze.

Table 4.2: The mapping between Morningstar Analyst/Quantitative ratings and unscaled scores.

Morningstar Analyst/Quantitative Rating	Unscaled Score
Gold	3
Silver	2
Bronze	1
Neutral	0
Negative	-1

Since Group 8 contains only 1 attribute (the Morningstar Medalist Rating) no intra-group weight is required.

4.2.4.9 Group 9: Sharpe Ratio

As seen in the third page of the PDF included in Appendix E:

> *The 3Y Sharpe Ratio is a measure of performance over the last 3 years adjusted for the level of risk of the investment. The Sharpe Ratio is calculated as the excess return (return above a treasury bill) divided by the standard deviation of the excess returns. A high Sharpe ratio (> 1) indicates a relatively high return:risk ratio and > 3 is considered excellent.*

Looking at the distribution of Sharpe ratios for the funds in the dataset (which can be found in Table 4.3), the values are distributed between -0.2 and 1.5, with a mean of 0.5. Since the funds in this dataset have been preselected for a 10 year annualised return of $> 14\%$ yet still show low Sharpe ratios, this indicates that many of the funds confer a relatively high level of risk weighted return.

Because the distribution of this statistic is relatively biased compared to what would be observed in the broader population of funds, the Sharpe ratio will be scored relative to the mean value of the 197 funds in the dataset. This is the same methodology that has been applied to mutual fund returns above, and adds additional value with it's ability to diminish the impact of outliers.

Scoring Function for Sharpe Ratio

In an identical manner to the scoring process for returns, the mean (μ) and standard deviation (σ) of the Sharpe ratios across all funds is first calculated. A preliminary score is generated according to:

$$\text{Preliminary Score} = \frac{\text{3-Year Sharpe Ratio} - \mu}{3\sigma}$$

Then the outliers beyond 3 standard deviations from the mean are clamped (see Footnote *a*) to $\mu \pm 3\sigma$. The inter-group weight is then applied to arrive at the final scores.

Since Group 9 contains only 1 attribute (Sharpe Ratio) no intra-group weight is required.

4.2.4.10 Group 10: Alpha

Alpha measures how much value (in %) the fund manager has added (or removed) compared to an investment in the fund's Morningstar Benchmark Index. A high alpha indicates that the fund has consistently outperformed its benchmark over the last 3 years, and the converse is true for a negative alpha.

Scoring Function for Alpha

Since the scoring system for alpha should be relative to the average performance of the funds in the dataset, and should be robust to outliers, the same scoring process used for Annualised Returns and Sharpe ratio is adopted. A preliminary score is calculated according to:

$$\text{Preliminary Score} = \frac{\text{3-Year Alpha} - \mu}{3\sigma}$$

Then the outliers beyond 3 standard deviations from the mean are clamped (see Footnote *a*) to $\mu \pm 3\sigma$, and inter-group weighting is applied to reach the final scores.

Since Group 10 contains only 1 attribute (Alpha) no intra-group weight is required.

4.2.4.11 Group 11: Beta

Beta is a measure of how sensitive the fund's performance is to the performance of it's Morningstar Benchmark index. The beta of the benchmark index is 1 by definition, and, for example, a fund with a 3 year beta of 1.1 has outperformed its index by 10% in rising markets, and performed 10% worse in falling ones.

Since markets are generally rising, and since a beta greater than 1 is desirable in rising markets, the scoring function for this attribute is designed to reward the funds with larger beta values. While a fund manager is able to influence the beta of their fund to some degree by changing the holdings of the fund in line with it's prospectus, it is unlikely that meaningful changes can be made during economic crises. As a result, it is assumed that a fund's beta is generally stable, and therefore the scoring function is not dependent on historical market conditions.

Scoring Function for Beta

Again to minimise the effect of outliers and assign scores relative to the other funds in the dataset Beta is scored in the same way as returns, Sharpe ratio, and alpha, calculating a preliminary score according to:

$$\text{Preliminary Score} = \frac{\text{3-Year Beta} - \mu}{3\sigma}$$

Then clamping (see Footnote *a*) outliers to $\mu \pm 3\sigma$, and applying inter-group weighting.

Since Group 11 contains only 1 attribute (Beta) no intra-group weight is required.

4.2.4.12 Applying the Automatic Scoring Process

At this point, the scoring functions presented above are applied to the relevant attributes in the dataset of 197 funds, and 23 scores are calculated for each of the funds using the intra-group weights where appropriate. Next, in Section 4.2.4.13, inter-group weights will be applied, and a total score calculated for each of the 197 funds. Then the process proceeds into the post-processing and final selection stages.

Table 4.3: Summary statistics for the raw attributes and final attribute scores, plus the final weights used in the scoring process.

	Attribute Statistics			Intra-group Weight	Inter-group Weight	Weighted Score Statistics		
	Min	Max	Mean			Min	Max	Mean
Fund size (M)	6.7	28,845.5	4,046.7	–	1.2	-11.4	14.8	5.8
Inception date	1984-03-27	2020-10-05	2008-03-29	–	3	0.0	3.0	1.1
1Y total return	1.5	56.7	30.7	1	1	-0.9	0.8	0.0
3Y annualised return	-6.6	25.2	8.4	3		-2.6	2.9	0.0
5Y annualised return	5.7	23.7	15.0	5		-5.0	5.0	0.0
10Y annualised return	11.4	20.9	15.6	10		-7.6	9.4	0.0
1Y +/- category	-12.7	29.2	8.2	1	0.25	-0.2	0.2	0.0
3Y +/- category	-8.5	17.3	2.3	3		-0.7	0.8	0.0
5Y +/- category	-6.1	7.6	1.8	5		-1.3	1.2	0.0
10Y +/- category	-2.5	13.8	1.8	10		-1.7	2.5	0.0
1Y +/- category index	-22.5	38.3	-1.1	1	0.25	-0.2	0.3	0.0
3Y +/- category index	-18.6	18.0	-2.7	3		-0.7	0.8	0.0
5Y +/- category index	-12.8	9.5	-1.4	5		-1.3	1.3	0.0
10Y +/- category index	-6.7	12.9	-0.4	10		-1.8	2.5	0.0
3Y Morningstar Rating	1	5	3.4	3	0.25	-0.6	0.4	0.0
5Y Morningstar Rating	2	5	3.7	5		-1.0	0.7	0.0
10Y Morningstar Rating	3	5	4.1	10		-1.4	1.2	0.0
Overall Morningstar Rating	3	5	4.0	18		-2.5	2.4	0.0
Ongoing charge	0.0	3.9	1.3	–	6	-5.3	6.0	1.1
Medalist Rating	-1	3	0.9	–	9	-9.0	27.0	8.1
3Y Sharpe ratio	-0.2	1.5	0.5	–	4	-2.6	3.5	0.0
3Y alpha (standard index)	-12.3	20.7	-1.0	–	10	-7.4	10.0	0.0
3Y beta (standard index)	0.7	1.2	0.9	–	2	-1.5	1.6	0.0

4.2.4.13 Inter-Group Weighting

In the previous sections 4.2.4.3 to 4.2.4.11 a total of 23 scores were calculated across 11 Groups of fund attributes using all of the 25 attributes from Appendix G.1. To the extent that a Group has more than one fund attribute then the preceding sections have also described a methodology for intra-Group weighting of multiple attributes within a Group.

Table 4.3 shows each of the 23 scored attributes in the first column. The horizontal ruled lines separate the 11 Groups. The Attribute Statistics (columns 2/3/4) show the minimum, maximum and mean values of each attribute across the 197 funds. The 5th column shows the Intra-Group Weights as described in the previous sections 4.2.4.3 to 4.2.4.11 where appropriate.

Before proceeding to calculate the total score for each of the 197 remaining funds, we must recognise two important things. Firstly, by the nature of the algorithms used in scoring the attributes, most of the attributes, or indeed attribute Groups, have been scored using a normalising algorithm with outliers clamped to a limit of $\pm 3\sigma$.

Secondly, it is important to recognise that, in calculating a final total score for each of the 197 funds from these 23 attribute scores that not all scores can or should be considered equally. In other words, they should not simply be added together to get a total score.

For example, consider how the 3 variants of performance scores (total/annualised, +/- category, and +/- category index) are weighted relative to each other. When assigning the relative importance of these scores, a justification can be made that both the +/- category, and +/- category index scores are less informative than the total/annualised score. This is on the basis that the total/annualised score is a representation of the performance of the fund in absolute terms, where every fund can be equally compared to every other.

Conversely, the +/- category, and +/- category index scores are relative to the average fund in the fund's Morningstar category and the category benchmark respectively. This means that a fund that performs poorly in absolute terms may still present excellent scores relative to its category and category index if the category as a whole has performed poorly over the time period. Because of this, the total/annualised, +/- category, and +/- category index scores are weighted at a ratio of 4:1:1 respectively. To be clear, whilst the principle is sound, the final weighting is subjective and the ratio of 4:1:1 was arrived at based on the manual review of dozens of examples.

To accommodate this phenomenon, an Inter-Group Weighting factor is introduced as column 6 in Table 4.3 to permit the adjustment for the importance to the total performance for each of the 11 main Groups of attributes.

This process serves 2 purposes. Firstly it adds the flexibility to add weights individually to the normalised Group scores to reflect their perceived importance and, secondly, it permits us to correct the fact that 3 of the 23 attributes were not calculated using a normalised process by adjusting their influence, either up or down, relative to their peers.

The process for selecting the values for the Inter-Group weights proceeded as follows:

1. The weights were initialised using a "best guess" approach.
2. The 23 individual attribute scores were calculated for each mutual fund.
3. The total score for the 197 mutual funds was calculated and the funds were ordered by decreasing score.
4. The statistics concerning the distribution of scores across the mutual funds were tabulated, showing the way that each attribute contributed to the total score.
5. The table was manually assessed to check for anomalies which, once identified, were corrected by adjusting the Inter-Group Weighting either up or down.

   In practice, Table 4.3, columns 7, 8 and 9 (Weighted Score Statistics) were used to see if the Min, Max and Mean scores seemed appropriate in the context of the total score and the relative contributions from other Groups of mutual fund attributes.

   For example the 3Y Alpha score is seen to be considerably more important than the 3Y Beta score which is reflected in the Inter-Group Rating of 10 versus 2.

   Furthermore, the Medalist rating is considered very important as it is the only forward looking metric, hence this feature receives an Inter-Group weight of 9.

   Also, as per above, the 3 variants of performance scores (total/annualised, +/- category, and +/- category index) are weighted relative to each other on the basis of 4:1:1 as can be seen in the final Inter-Group Weightings for these Groups.

6. Steps 1 to 5 were iterated, as every change to the Inter-Group Weights changed the total score and all of the internal relativities, and the model had to be rerun to calculate all of the Scores each time their was a change.
7. After 7 iterations the final position adopted is shown in Table 4.3.

It is important to recognise that this automatic process is designed to create a ranking of 197 mutual funds from best to worst based on a scoring system covering 25 attributes and creating 23 individual scores. However, this is not the end of the process, and does not constitute the final selection or recommendation for the client. Following this is a postprocessing stage based on the calculated scores, and a more detailed manual review in order to make the final selection.

The manual review is a much more detailed analysis of each mutual fund covering a number of key documents up to and including each fund's full prospectus document (often over 100 pages in length). The automatic process simply serves to highlight the highest performing mutual funds and order them for the manual review. It is anticipated that a suitable selection of 5 funds for investment can be found through manual investigation of the top 50 to 60 ranked mutual funds and that it will become clear that only the top 1/3 of the ranked list is relevant in selecting the best of the best for investment.

4.2.5 Automatic Post-processing

Following the automatic scoring and weighting process, a few additional selection criteria are enforced to remove additional mutual funds that would never be considered for investment by the client. The following rules are applied automatically:

- Mutual funds without a defined benchmark are removed. Funds are usually missing benchmarks because they operate in very niche sectors or geographies, or they are synthetically constructed. The client wishes to avoid such funds to avoid taking on unnecessary risk, so 12 mutual funds are removed for this reason.
- Mutual funds with the *Morningstar Category* "India Equity" are removed, as the client is not willing to invest in funds that are restricted to this geography. 30 mutual fund classes are removed for this reason.
- Mutual funds with a size less than 300 million USD are removed, as fund size is a strong indicator of the public perception of a fund, and funds smaller than this are considered too risky considering that many high-performing alternative funds manage upwards of 1 billion USD. 22 additional mutual funds are removed for this reason.
- A *Total Annualised Return Score* is calculated by adding up the 1Y total return, and 3Y/5Y/10Y annualised return scores. Any funds that fall below 1 standard deviation below the mean *Total Annualised Return Score* ($< \mu - 1\sigma$) are removed. 21 additional mutual funds are removed for this reason.
- A *Total Rear-facing Score* is calculated by adding up all the attributes that are based on the historical performance of the fund. This includes each of the 1, 3, 5, and 10 year annualised return scores, as well as the +/- category, +/- category index, Morningstar rating, Sharpe ratio, alpha, and beta scores. Any funds with both a negative *Total Rear-facing Score* and a negative overall score are removed. 17 additional mutual funds are removed for this reason.

This brings the total number of funds from 197 to 95.

4.2.6 Manual Post-processing and Final Selection

Now that the automatic scoring process is complete, the remaining 95 funds can be sorted by their total scores. This results in a list of funds that is exported to a spreadsheet with these 95 rows, a column for each of the attributes listed in Appendix G, a column for each of the 23 scores detailed above, and a column for the total score.

In this spreadsheet, some formatting is done to emphasize the important features to consider during the manual selection process. This includes:

- Highlighting all missing data values in orange,
- Highlighting all inception dates later than 01/01/2014 in yellow,
- Highlighting all manager start dates more recent than 01/01/2014 red,
- Highlighting the fund benchmark and Morningstar benchmark green when they are the same for a fund, and orange otherwise,

- Highlighting any outliers (beyond 3 standard deviations from the mean) in yellow for all columns where the mean and standard deviation are used to normalise the scores.

With this formatted spreadsheet, a manual process must now be undertaken to produce a shortlist of funds best suited for the client's portfolio. This process aims to identify individual classes of funds which are traded in the most desirable currency available and the steps are described in the remainder of this section.

4.2.6.1 Deduplication of Currencies and Classes

As mentioned above, some mutual funds in the scored list present in multiple classes and currencies. Since the underlying securities are the same for these different variants of the fund, it is now necessary to identify the best option and eliminate the others.

To process these duplicates easily, funds are grouped together based on the similarity of their names. This is done using the Jaccard Text Similarity metric, with a suitable similarity coefficient. This groups all classes and currencies of the same fund together so that duplicates can be identified and processed quickly. This process divides the 95 funds into 49 groups, meaning that on average each fund presents just under 2 classes or currencies.

At this point, the process continues by looking at each group (which represent the different variants of a single fund) and:

1. Removing any classes that cannot be invested in. This includes classes like R, K, J, S, X, and Z, and more information about fund classes is provided in Section 1.2.1.1. This results in the removal of 19 mutual fund classes.
2. Removing any variants where the same fund *class* is offered in a more desirable *currency*.[1] This results in the removal of 11 additional mutual fund classes.
3. Removing all variants except the one with the highest score. This is an additional 28 mutual funds.

This process ensures that each fund will present only a single class and currency combination, and that the remaining variant will be in the most desirable currency available, of an investable class, and have the best performance achievable in that fund. This leaves 37 mutual funds from the list of 95.

4.2.6.2 Manual Review

The process has now produced a ranked and de-duplicated dataset of 37 mutual funds and their data. The funds with the highest scores must now be manually evaluated to generate final recommendations for the client's portfolio. The 9 attributes that were reserved for manual selection should now be reviewed. These are:

- `12M yield`
- `manager start date`
- `Morningstar benchmark`
- `3Y alpha (best fit index)`
- `max annual charge`
- `max exit charge`
- `max initial charge`
- `minimum initial investment`
- `fund benchmark`

Looking at the 37 mutual funds that are selected by the automatic process in more detail its is possible to reject many of these funds on the following grounds:

1. The fund manager is not disclosed whilst the start date is stated and acceptable. On this basis it is not possible to know if the fund manager has recently changed, which is a risk for any mutual fund investment.
2. The prospectus is not transparent and the specific details of the portfolio choice are unclear. Again, if a mutual fund is not transparent about the securities that it is investing in, then it represents an unreasonable level of risk for investment.
3. The fund prospectus is too narrow in its available investment options. This can be in geography (certain funds specialise in specific countries, such as Taiwan, and others restrict themselves to larger regions like Europe), or in CAP size (a fund that only invests in Microcaps), or in its sector options (certain funds invest in specific technologies like solar). A narrow prospectus increases risk since the fund manager is

[1] For the client of this report, the most desirable currency is USD, with the order of preferences being USD > EUR > GBP > GBX > CHF > JPY.

unable to escape crises that affect their entire sector. If we have a range of broader options like Global Technology (which we do) then these are clearly preferable.

4. If the Fund Manager has been in place for less than 10 years then it is too early to consider the fund as an investment option without undue risk that the new manager may be taking the fund on a downward trend. The reason that these funds are not removed automatically is because managers transferring from other successful funds in the same sector can often be seen through external research to be top performers in their sectors over the longer term.
5. If the Fund Manager has not defined a suitable benchmark against which the funds performance is measured then it is not possible to assess the performance level easily and the fund has to be rejected.
6. The fund has prohibitively large performance or exit fees. While these can sometimes be negotiated, other funds are rejected for this reason.

After reviewing all 37 funds based on these criteria, it is possible to reduce the list to 14 funds from which the intention is to find 3–5 mutual funds for investment, along with 2–3 ETFs in the sections that follow.

To see the details of the 14 funds along with the relevant attributes and scores please refer to the excel spreadsheet named `2024-01-21-mutual-fund-ranking.xlsx`, which can be downloaded directly from `www.lfern.com/extra/finance/2024-01-21-mutual-fund-ranking.xlsx`.

4.2.7 Mutual Fund Selection Results

Based on this set of 14, a final set of mutual funds recommended for investment can be selected using the following approach:

1. Start from the top of the list, sorted by descending total scores.
2. Review in detail all of the information available for this mutual fund on the `morningstar.co.uk` website, including the latest Morningstar summary reports, the Key Investor Information Document, the Factsheet and, if necessary, the full Prospectus document. The purpose of the review is twofold:
   (a) To check all of the information gathered and entered into the scoring algorithms looks correct.
   (b) To check if there are any other areas of concern.
3. Check the Swissquote fee for buying this mutual fund is acceptable given the relative performance of the fund compared to its peers on the final short list of 14 funds. Note that Swissquote's fees for purchasing its Prime partner funds (comprising 33 Fund Managers) is a flat fee of circa 9 USD. At the same time the "Funds under custody" (3 fund manager organisations) are free to buy, and the remaining funds (called Vanilla funds) incur a fee of 0.5% on purchase payable to Swissquote. So a purchase of 1 million dollars worth of a Vanilla fund will cost USD 5,000 on a once off on purchase compared to a Prime partner fund purchase of the same value which will cost circa USD 9. Generally Vanilla funds should be removed from the list and alternatives should be found.
4. Check the fund against the other funds that are already in the list of finalists. If there is significant overlap with a higher-scoring fund in terms of either investment strategy or company-level investments, then the fund should be excluded. This ensures a level of diversity in the final recommendations, and ensures that the list of finalists does not consist entirely of a small number of large American technology firms.

Following the above approach the final list of 5 mutual funds is shown in Table 4.4. The funds are ordered based on analysis of their score, as well as the forward looking Morningstar Medalist Rating, and the degree to which they maximise the diversity of stocks in the final selection.

Table 4.4: The top 5 funds output from the selection process defined in Section 4.2.4

Rank	Fund Name	Fund Class	10Y Return	Score
1	Fidelity Funds - Global Technology Fund	Y	20.0%	53.3
2	Legal & General Global Technology Index Trust	I	18.9%	61.3
3	UBS (Lux) Equity SICAV - USA Growth	I-B	17.0%	20.0
4	CT (Lux) - Global Technology	AU	20.9%	34.1
5	BlackRock Global Funds - World Technology Fund	A2	17.2%	12.2

While this set of mutual funds does appear to have a relatively high concentration of global technology funds, detailed analysis of the individual funds and their composition shows that they do select relatively different

companies in which to invest. In addition to this, the global nature of the funds is a considerable advantage, as this allows fund managers to change their holdings to avoid crises in specific regions. For example, if there was a crisis in US markets, the manager could increase exposure to Asian or European markets.

This final set of fund recommendations, combined with the recommended set of ETFs produced in the following section, can now be discussed with the client to determine a final investment strategy.

4.3 ETF Selection

The processes for gathering ETF data, processing it, and generating a list of recommendations now proceeds in a very similar way to how mutual funds were analysed in Section 4.2. The same general requirements that were defined in Section 4.1 and applied to mutual funds are applied again here to ETFs. Data is then collected in much the same way from Morningstar's ETF screener, and a very similar automatic scoring process is applied. The scoring process differs only slightly here since the ETF data is generally less complete.

The remainder of this section details the ETF selection process, emphasising the elements that are different from mutual fund selection.

4.3.1 Preprocessing and Preselection

Morningstar's ETF database contains just over 14,200 funds. In this section the general requirements from Section 4.1 are applied, bringing the total amount of ETFs under consideration down to 119.

First, as described in Section 4.1.1, approximately 4,400 distribution funds are removed from the set of 14,200 total ETFs. Following this, the remaining 9,800 funds are checked against a 10 year annualised performance threshold of 12.9% (as defined in Section 4.1.3). Funds that do not meet this threshold are discarded, leaving 121 funds.

Next, a second check is done for any funds with a size greater than 10 Billion USD, and any of these that were excluded based on their 10 year performance are added back into the dataset. These funds are included as they provide a valuable way to assess the effectiveness of the scoring system against funds with significant public support. In 2024, no funds were added back as a result of this check.

In the final preprocessing step, funds with a minimum initial investment greater than 1.5 Million USD are removed (see Section 4.1.3). 2 additional funds were removed for this reason. At the end of the preprocessing stage the dataset contains 119 funds, of which 110 are denominated in USD, and 9 in EUR. The scoring and ranking process is then conducted on this set of 119 funds.

4.3.2 Automatic Scoring and Ranking Process

Again, similarly to the mutual fund selection process, scoring of ETFs relies on an automatic process followed by a manual investigation. The process here is slightly different to the mutual fund scoring system since the data presented for ETFs is generally less complete than what is presented for mutual funds.

4.3.2.1 Dealing with Missing Data

The main cause of missing data is non-traditional ETF varieties, such as leveraged funds (see Section 1.2.2.5) and cryptocurrency trackers (see Section 1.2.2.3). These ETFs make up approximately 30% of the dataset that is extracted from Morningstar. In most cases, data is missing because Morningstar does not assign a benchmark (and by extension a benchmark index) to these fund types. As a result they do not present data for any score that is calculated relative to an ETFs category or benchmark index.

There are a few reasons that Morningstar does not assign benchmarks to these funds. Primarily, this is because no logical benchmark exists, for example in the case of leveraged funds, rare earth metal funds, and cryptocurrency trackers. In the case of leveraged funds, which account for most of the funds without benchmarks in our dataset, these cannot be assigned benchmark indices since their synthetic construction makes it illogical to compare them with traditional securities. In the case of cryptocurrency and rare earth metal trackers, these funds exist to track such specific sets of securities that no independent benchmark exists.

After manually checking the ETFs without benchmark indices, it was decided that they should be removed from the dataset for three reasons. Primarily, leveraged funds and cryptocurrency trackers are highly volatile, risky investments. While the client is interested in achieving a high level of return on their investment, the risk conferred by non-traditional funds like these is considered too large. Many leveraged funds also state in their prospectuses that they are *not recommended for long term investment.* Secondly, these funds generally lack transparency in their construction and operation. Reading the prospectuses for these funds is often insufficient to form a complete picture of their operation, which makes these funds hard to recommend for investment. This is also true of other non-traditional fund varieties, including synthetic and *swap* funds, which are also removed at this stage.

Finally, these funds are removed since including them would make it challenging to maintain a fair scoring system. If these funds were included and simply not scored for the attributes they were missing, they would naturally fall to the bottom of the ranking due to the fact they have less attributes to generate scores from. On

the other hand, if these attributes were ignored for all funds, this would equalise the playing field, but discard valuable data about important, traditional ETF varieties. Based on these three justifications, funds without a Morningstar category are discarded at this point.

This is a total of 35 funds from the dataset of 119, and after removal the remaining 84 funds proceed into scoring and ranking based on the attributes listed in the following subsections.

4.3.2.2 Scoring and Ranking of ETFs

Since the instances with large amounts of missing data were eliminated in the previous section, the ETF scoring process can now proceed in a similar way to the mutual fund selection process outlined in Section 4.2.4. Since all of the automatic selection attributes listed in Appendix G.1 are present for ETFs, the following attribute groups are scored identically to how they were processed for mutual funds:

- Fund Size, as in Section 4.2.4.1,
- Inception Date, as in Section 4.2.4.2,
- Total/Annualised Returns, as in Section 4.2.4.3,
- Return Relative to Category, as in Section 4.2.4.4,
- Return Relative to Category Index, as in Section 4.2.4.5,
- Morningstar Ratings, as in Section 4.2.4.6,
- Ongoing Charge, as in Section 4.2.4.7,
- Medalist Ratings, as in Section 4.2.4.8,
- 3Y Sharpe Ratio, as in Section 4.2.4.9,
- 3Y Alpha, as in Section 4.2.4.10,
- 3Y Beta, as in Section 4.2.4.11.

This means that the scoring functions, intra-group weights (where appropriate), and inter-group weights are all copied directly from the relevant mutual fund sections. Statistics concerning the distribution of attributes, scores, and weights are presented in Table 4.5.

4.3.2.3 Inter-group Weighting

The final weights used in the ETF scoring process are detailed in Table 4.5. These are taken directly from Section 4.2.4.13. The scoring process proceeds by calculating the raw score for each attribute using the relevant scoring function, then multiplying each score by its intra-group weight (where appropriate) and inter-group weight. These weighted attribute scores are summed over the attributes of each fund to calculate its final score.

Table 4.5: Summary statistics for the raw attributes and final attribute scores, plus the final weights used in the ETF scoring process.

	Attribute Statistics			Intra-group Weight	Inter-group Weight	Weighted Score Statistics		
	Min	Max	Mean			Min	Max	Mean
Fund size (M)	76.2	74,863.2	11,570.6	–	1.2	-3.7	17.8	7.7
Inception date	2007-01-08	2016-04-29	2010-02-09	–	3	0.0	1.4	0.8
1Y total return	-1.7	57.0	26.8	1	1	-0.6	0.7	0.0
3Y annualised return	2.1	20.1	11.7	3		-3.0	2.7	0.0
5Y annualised return	10.9	26.9	16.1	5		-2.0	4.1	0.0
10Y annualised return	12.9	23.2	16.0	10		-3.4	8.0	0.0
1Y +/- category	-20.6	29.4	6.7	1	0.25	-0.2	0.2	0.0
3Y +/- category	-4.7	18.2	3.8	3		-0.4	0.7	0.0
5Y +/- category	-2.2	10.2	2.9	5		-0.6	0.9	0.0
10Y +/- category	0.1	7.6	2.7	10		-1.0	1.9	0.0
1Y +/- category index	-24.4	16.4	0.0	1	0.25	-0.3	0.2	0.0
3Y +/- category index	-5.2	6.0	0.9	3		-0.8	0.7	0.0
5Y +/- category index	-3.3	4.9	0.5	5		-0.8	0.9	0.0
10Y +/- category index	-2.0	4.4	0.6	10		-1.4	2.0	0.0
3Y Morningstar Rating	2	5	3.8	3	0.25	-0.5	0.4	0.0
5Y Morningstar Rating	2	5	4.0	5		-1.0	0.5	0.0
10Y Morningstar Rating	3	5	4.5	10		-1.7	0.5	0.0
Overall Morningstar Rating	3	5	4.4	18		-2.9	1.2	0.0
Ongoing charge	0.1	0.7	0.2	–	6	3.2	5.8	5.2
Medalist Rating	0	3	2.0	–	9	0.0	27.0	17.7
3Y Sharpe ratio	0.2	1.7	0.7	–	4	-3.4	4.0	0.0
3Y alpha (standard index)	-0.7	7.7	2.8	–	10	-4.8	6.7	0.0
3Y beta (standard index)	0.5	1.3	0.8	–	2	-1.5	2.0	0.0

4.3.3 Automatic Post-processing of ETFs

Similarly to how mutual funds were automatically excluded in Section 4.2.5, certain ETFs are also removed after the scoring process by enforcing the following rules:

- Funds with a size less than 300 million USD are removed, which is the same threshold enforced for mutual funds. This results in the removal of 6 ETFs from the data set of 84, leaving 78 ETFs.
- A *Total Annualised Return Score* is calculated by adding up the 1Y total return, and 3Y/5Y/10Y annualised return scores. In the same way that mutual funds were removed, any funds that fall below 1 standard deviation below the mean *Total Annualised Return Score* ($\mu - 1\sigma$) are excluded. This is an additional 3 ETFs.

Following these steps, 75 ETFs remain in the dataset.

4.3.4 Manual Post-processing and Final Selection of ETFs

The process has now produced a ranked dataset of 75 ETFs and their data in a similar way to the mutual fund process. A manual process is now undertaken to identify individual classes of funds which are traded in the most desirable currency available. The methodology for deduplicating ETFs is the same methodology described for mutual funds in Section 4.2.6.1 (Deduplication of Currencies and Classes), and this process results in the removal of 60 out of 75 ETFs from the list. The proportion of removed ETFs is large here because many of the ETFs that made it to this point in the selection process present many currency variants.

Following deduplication of currencies and classes, any synthetic ETFs that were not removed earlier are excluded. Synthetic ETFs confer additional risk over traditional ETF varieties in the form of *counterparty risk* (see Section 1.2.2.4), and the client wishes to avoid this additional risk at this time. Most of these ETFs are easily identified as they have terms such as *swap* in their name, and most synthetic ETFs were removed earlier when funds without benchmarks were excluded. 3 additional synthetic ETFs are identified and removed at this stage.

This results in a list of 12 ETFs which can be found in the excel spreadsheet `2024-01-22-ETF-ranking.xlsx`. This spreadsheet can be downloaded directly from `www.lfern.com/extra/finance/2024-01-22-ETF-ranking.xlsx`.

4.3.4.1 Manual Review and Final Selection of ETFs

Considering the smaller size of the ETF data set, it is possible to produce a final list of fund recommendations based directly on this shortlist of 12 funds. The approach to produce this list of finalists is as follows:

1. Starting with the highest scoring ETF, work through the list in order of descending score. Apply the following steps.
2. Remove funds which are restricted to highly specialised sectors or geographies. Many of these specialised funds are removed as a result of the 300 million USD size threshold, but certain funds that are restricted to geographies such as Taiwan are removed at this stage.
3. Review the age of the fund and the tenure of the fund manager. While this is a larger consideration for mutual funds due to their active management, ETFs with very recent inception dates, or very new managers should be reviewed and considered for removal.
4. Review in detail all of the information available for the ETF on the `morningstar.co.uk` website. This includes the latest Morningstar summary reports, the Key Investor Information Document, and the Factsheet. The purpose of the review is twofold:
   (a) To check all of the information gathered and entered into the scoring algorithms looks correct.
   (b) To check if there are any other areas of concern.
5. Check that the ETF is available for purchase through Swissquote. Exclude any funds that are not purchasable.
6. Check the ETF against the other ETFs that have already been added to the list of finalists. Many ETFs have significant overlap in their composition and holdings, as multiple companies may establish ETFs to the same underlying markets. Any funds that overlap significantly with higher-scoring options should be excluded.

On this basis, the list of 3 finalists presented in Table 4.6 is produced.

Table 4.6: The top 3 funds output from the ETF selection process.

Rank	Fund Name	Fund Ticker	10Y Return	Score
1	iShares Core S&P 500 UCITS ETF USD	SXR8	14.7%	55.8
2	Xtrackers MSCI World Information Technology	XDWT	21.4%	50.8
3	iShares NASDAQ 100 UCITS ETF USD	SXRV	20.7%	39.6

This list of ETF finalists is relatively similar to what was seen for mutual funds in that both sets of finalists include world technology funds, US technology funds, and broader-based S&P 500 style securities. Looking at the final list of ETFs, it is worth noting that the highest 10-year return observed is 21.4%, exceeding the 20.9% achieved by the highest-performing mutual fund.

At this point, the final lists of ETFs and mutual funds were presented to the client and a final investment strategy was determined by considering the individual funds as well as the trade-offs between passive and active management.

Chapter 5

Summary and Conclusions

5.1 Summary

In this report, various investment options were investigated with the objective of producing a recommendable, high-performing, and low-maintenance investment portfolio, specifically tailored to the preferences of the client. To put forth a robust and logical argument for the proposed portfolio, Chapter 1 investigates the various investment options available, concluding that mutual funds and ETFs are the most appropriate investment vehicles for the client. Chapter 2 then looks at the specific geographies and sectors that have the strongest historical performance. This review concludes that the US has been the best performing region for investment over the last 3 decades, and that the technology sector has seen especially high returns.

With this background in mind, Chapter 3 looks at selecting an appropriate broker through which high-performing investments can be made. Swissquote is determined to be the most appropriate broker for the client due to their low fees, large selection of available funds, and critically, their outstanding safety and security. Following this, Chapter 4 proposes a novel and detailed methodology for evaluating both mutual funds and ETFs using data from Morningstar. As a result of this process, the following 5 mutual funds are recommended for the client:

1. Fidelity Funds - Global Technology Fund,
2. Legal & General Global Technology Index Trust,
3. UBS (Lux) Equity SICAV - USA Growth,
4. CT (Lux) - Global Technology,
5. BlackRock Global Funds - World Technology Fund.

The following 3 ETFs are also recommended as part of the complete portfolio:

1. iShares Core S&P 500 UCITS ETF USD,
2. Xtrackers MSCI World Information Technology UCITS ETF,
3. iShares NASDAQ 100 UCITS ETF USD.

While these recommendations are a result of multiple iterations of the scoring and selection process, performed in direct collaboration with the client, the recommended broker and portfolio may *not* be appropriate for a client with different preferences. Additionally, these results reflect the current economic climate, and are based on recently captured historical data. As such, they are expected to change over time as a result of changing fund managers and broader or unexpected economic conditions. It is therefore recommended that this process be reviewed annually to maintain a portfolio in line with the client's preferences.

5.2 Conclusions

Comparing mutual funds and ETFs throughout the fund analysis in Chapter 4, it is consistently observed that very few mutual funds beat the performance of their benchmark index. In this way, mutual fund managers are massively underperforming, which has significant implications when selecting between passively and actively managed investment options. Since fund managers are generally unable to consistently outperform their benchmark indices, the average fund manager is necessarily falling behind the average return of S&P 500 and Nasdaq trackers, as these are two of the highest performing indices.

This is exemplified with a few statistics taken from the mutual fund and ETF selection data. Firstly, the average alpha of the 5 mutual fund finalists is -1.7, meaning that even in the top 5 mutual funds (those that made it through *all* stages of the selection process), the fund managers are underperforming their benchmarks by an average of 1.7% over the past 3 years. Conversely, the average alpha of the ETF finalists is 4.9, indicating that these funds have considerably outperformed the benchmarks assigned to them by Morningstar over the past 3 years.

Looking at similar statistics over a 10 year period, we observe that the ETF finalists have, on average, exceeded their Morningstar benchmarks by 1.7%. For the top 5 mutual funds, this number is -1.2%, indicating yet again

that even the top performing fund managers are unable to consistently exceed their benchmarks over extended periods of time. Because of this, it is essential to consider the value added by the manager of any mutual funds in one's portfolio, and to ensure that the manager is adding positive value to the investment after accounting for their additional fees.

While the managers of the top 4 recommended mutual funds do seem to have achieved positive alpha in recent history, this is not the case for the vast majority of mutual funds, and may not be the case for these funds in the future. When this process is revisited, it will be essential to evaluate the continued performance of the fund managers, and to consider whether a shift towards passively managed funds could result in greater levels of risk-weighted return.

Appendices

Appendix A

List of Stock Exchanges – Wikipedia

(Captured December 22nd 2022)

#	Year	Stock exchange	MIC	Region	Market place	Market cap (USD tn)	Monthly trade volume (USD bn)
1	2022	New York Stock Exchange	XNYS	United States	New York City	26.2	1,452
2	2022	Nasdaq	XNAS	United States	New York City	19.4	1,262
3	2022	Shanghai Stock Exchange	XSHG	China	Shanghai	7.37	536
4	2022	Euronext	XAMS XBRU XMSM XLIS XMIL XOSL XPAR	Europe	Amsterdam Brussels Dublin Lisbon Milan Oslo Paris	6.41	174
5	2022	Shenzhen Stock Exchange	XSHE	China	Shenzhen	5.74	763
6	2022	Japan Exchange Group	XJPX	Japan	Tokyo	5.16	481
7	2022	Hong Kong Stock Exchange	XHKG	Hong Kong	Hong Kong	4.97	182
8	2022	Bombay Stock Exchange	XBOM	India	Mumbai	3.96	
9	2022	National Stock Exchange	XNSE	India	Mumbai	3.40	
10	2022	Toronto Stock Exchange	XTSE	Canada	Toronto	3.25[5]	97
11	2022	London Stock Exchange	XLON	United Kingdom	London	3.07[6]	219
12	2022	Saudi Stock Exchange (Tadawul)	XSAU	Saudi Arabia	Riyadh	3.05	
13	2022	SIX Swiss Exchange	XSWX	Switzerland	Zurich	1.80	77
14	2022	Deutsche Börse AG	XFRA	Germany	Frankfurt	1.75	140

15	2022	**Nasdaq Nordic and Baltic Exchanges**		Europe	1.74

Stock exchanges [hide]

Stock exchange	MIC	Region	Market place	Time zone
Copenhagen Stock Exchange	XCSE	Denmark	Copenhagen	CET/CEST
Stockholm Stock Exchange	XSTO	Sweden	Stockholm	CET/CEST
Helsinki Stock Exchange	XHEL	Finland	Helsinki	EET/EEST
Tallinn Stock Exchange	XTAL	Estonia	Tallinn	EET/EEST
Riga Stock Exchange	XRIS	Latvia	Riga	EET/EEST
Vilnius Stock Exchange	XLIT	Lithuania	Vilnius	EET/EEST
Iceland Stock Exchange	XICE	Iceland	Iceland	GMT

16	2022	Korea Exchange	XKOS	South Korea	Seoul Busan	1.67
17	2022	Australian Securities Exchange	XASX	Australia	Sydney	1.60
18	2022	Taiwan Stock Exchange	XTAI	Taiwan	Taipei	1.55
19	2022	Johannesburg Stock Exchange	XJSE	South Africa	Johannesburg	1.36
20	2022	Tehran Stock Exchange		Iran	Tehran	1.35
21	2022	B3 Brasil Bolsa Balcão		Brazil	São Paulo	0.87

Appendix B

Relative Market Capitalisation of Largest 21 Stock Exchanges

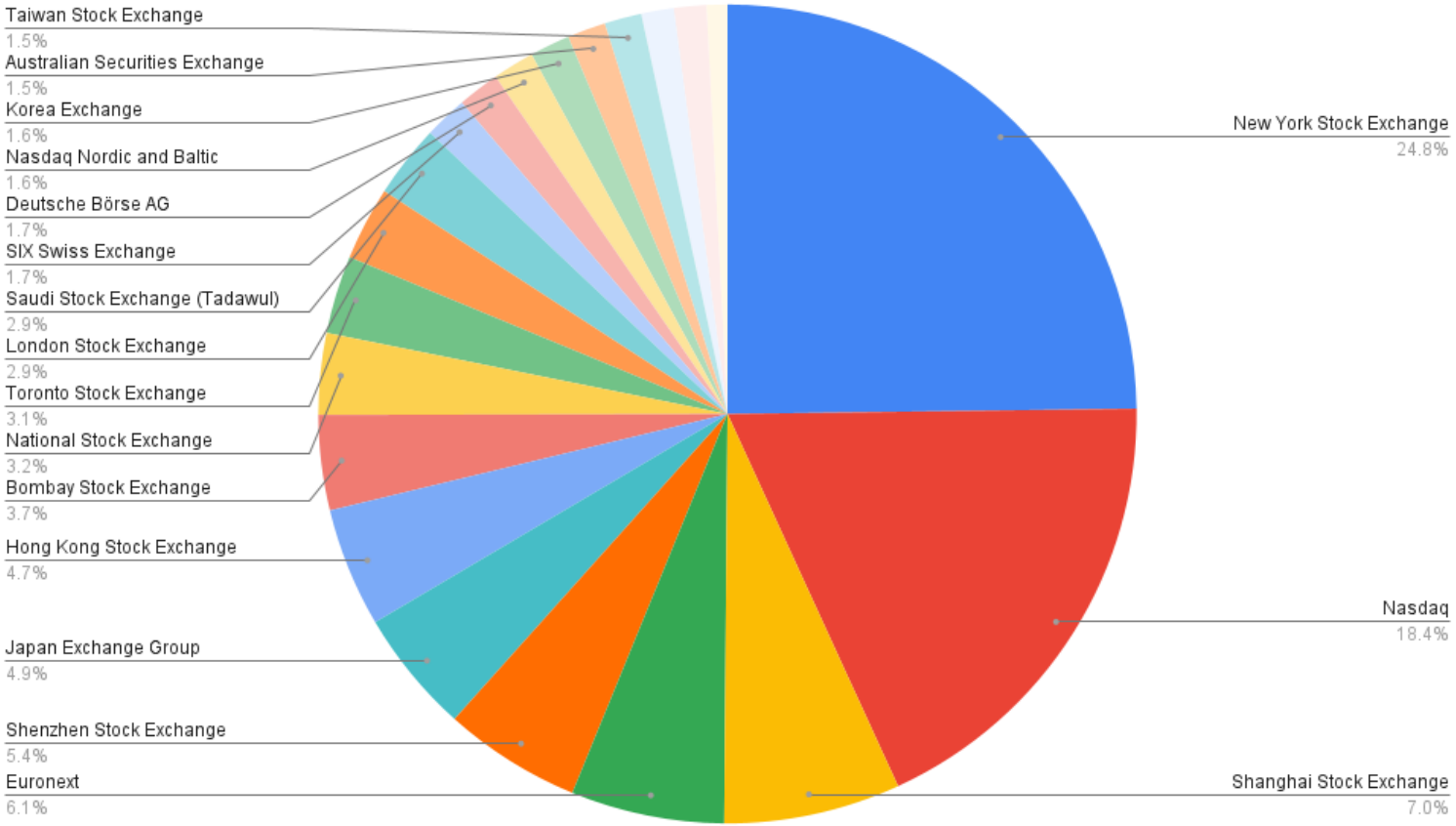


Figure B.1: Pie chart comparing the market capitalisation of the 21 largest global stock exchanges.

Appendix C

Index Comparison Graphs

C.1 All Indices

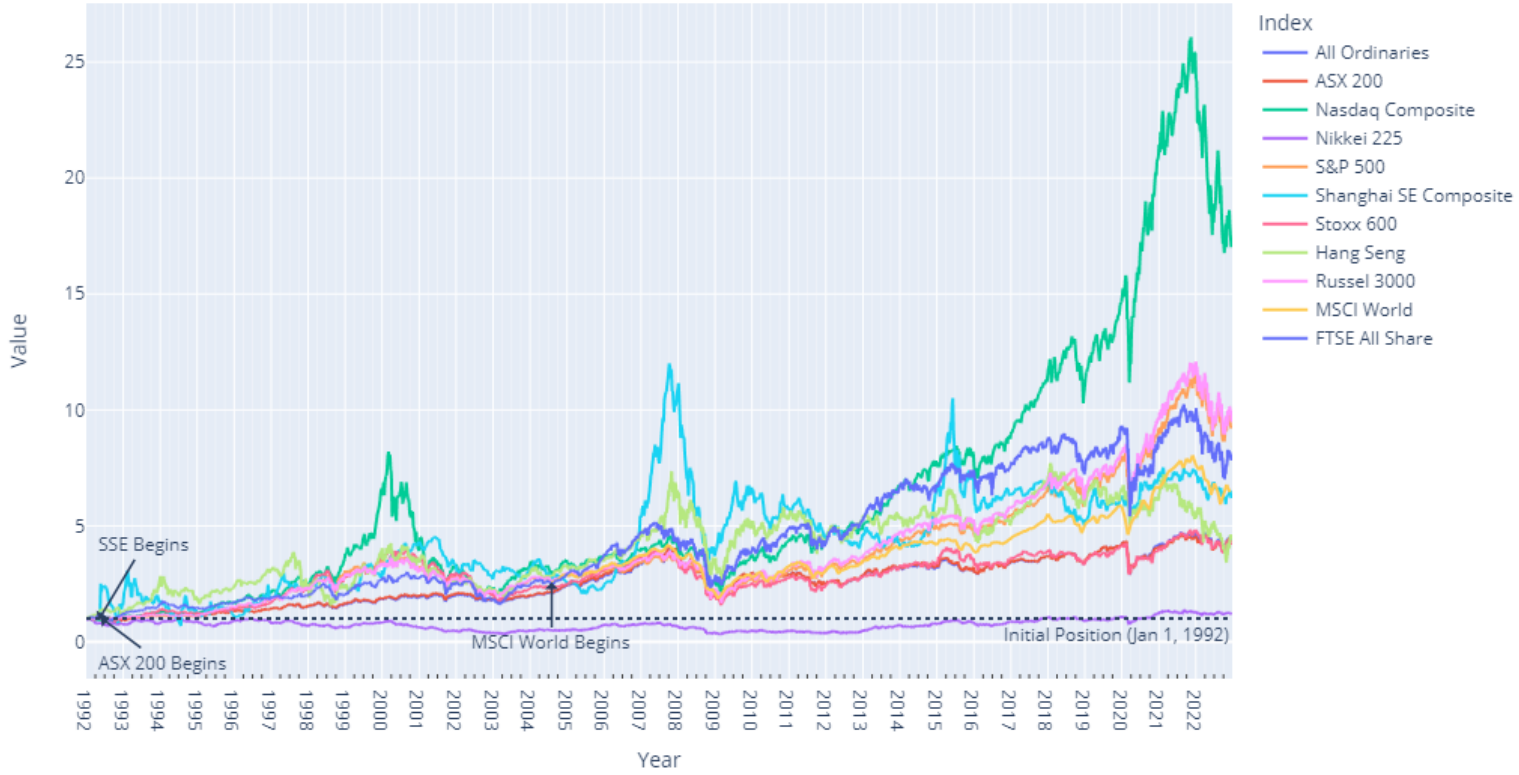


Figure C.1: Comparing the performance of all selected indices.

C.2 Excluding the ASX 200, FTSE All Share Index and Russel 3000

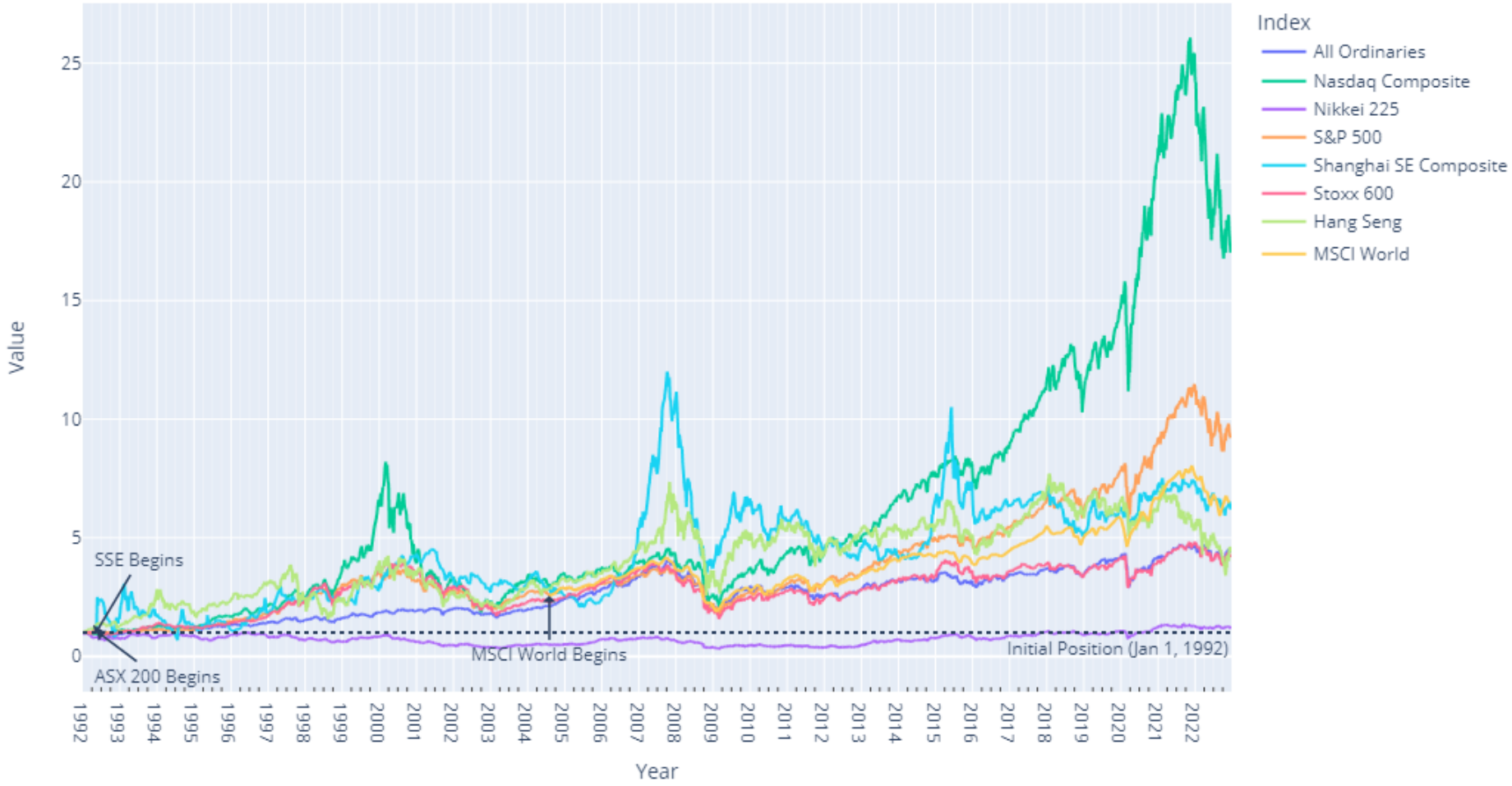


Figure C.2: The index performance graph excluding the ASX 200, FTSE All Share Index and Russel 3000 to reduce clutter.

C.3 Further Excluding the NASDAQ

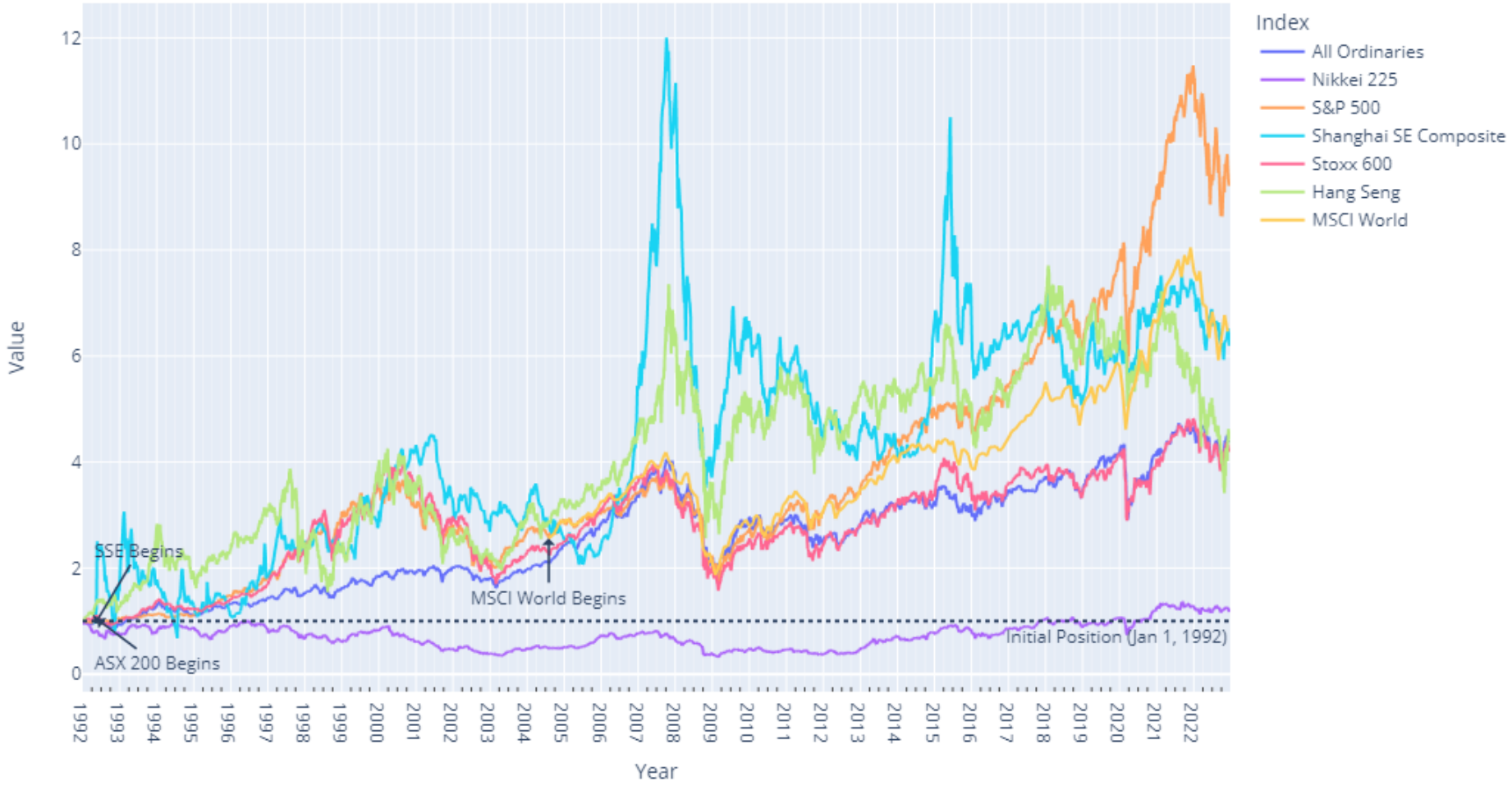


Figure C.3: The index performance graph from Figure C.2 excluding the NASDAQ Composite Index to rescale the y-axis.

Appendix D

Global Stock Market Performance - 30 Years

Index	Annualised Global Stock Market Performance (%)					
	10 Year			20 Year		30 Year
	1992-2002	2002-2012	2012-2022	1992-2012	2002-2022	1992-2022
All Ordinaries	7.0	4.6	4.4	5.8	4.5	5.3
ASX 200	7.3	4.5	4.2	5.9	4.3	5.3
Nasdaq Composite	7.4	8.4	12.9	7.9	10.6	9.6
Nikkei 225	-6.4	2.2	9.4	-2.2	5.8	1.5
S&P 500	7.8	4.9	10.1	6.3	7.5	7.6
Shanghai SE Composite (SSE)	4.0	5.6	3.0	4.8	4.3	4.2
Stoxx 600	7.5	3.2	4.1	5.3	3.7	4.9
Hang Seng	5.4	9.3	-1.4	7.3	3.8	4.3
Russel 3000	7.0	5.6	10.1	6.3	7.8	7.5
MSCI World	N/A	4.4	3.1	4.4	5.5	5.5
FTSE All Share	4.2	11.1	4.3	7.6	7.6	6.5

Table D.1: Annualised Global Stock Market Performance of all indices being compared over each 10 year period from 1992–2022, plus 20 and 30 year annualised rates. Red cells did not have data for the full period but still contain an annualised rate for the present data when possible. This was only necessary for the MSCI World index, as all others have data starting before the end of 1992.

MSCI World data begins in August of 2004, and it is important to keep this in mind when interpreting results since this causes the 1992–2012, 2002–2012, 1992–2022, and 2002–2022 to actually begin in August 2004. These percentages are therefore annualised over 7.3 and 17.3 years of data.

Appendix E

Morningstar Fund Summary Glossary

This appendix shows the standardised pro forma used by fund managers and adopted by Morningstar to show data related to a mutual fund. Morningstar offers this document for each fund in their database, and this summary has been annotated with definitions of the terms and concepts it contains.

Numbers in square brackets (`[ ]`) reference definitions that could not be overlaid on the document due to space constraints and instead appear with the corresponding number after the annotated document within this appendix.

Pictet-Digital PUSD

NAV (Net Asset Value) is calculated daily, and is the value of a single share in a mutual fund. It is calculated as the value of all the cash and securities in a fund's portfolio, divided by the number of shares issued by the manager.

Day Change is the percentage increase/decrease in NAV of a fund compared to the previous day's price.

Performance History

Performance History Graph [2]

Growth of 1,000 (GBP) Advanced Graph

	2016	2017	2018	2019	2020
Fund	29.2	25.2	-1.7	20.5	15.1
+/-Cat	1.3	-0.1	1.6	-9.6	-4.6
+/-B'mrk	-3.7	-1.1	-5.2	-21.4	-7.0

Category: Sector Equity Technology

Category Benchmark: MSCI World/Information Tech...

Key Stats

NAV 24/07/2020	USD 439.49
Day Change	-2.79%
Morningstar Category™	Sector Equity Technology
ISIN	LU0101692670
Fund Size (Mil) 24/07/2020	USD 4381.00
Share Class Size (Mil) 24/07/2020	USD 463.94
Max Initial Charge	5.00%
Ongoing Charge 29/06/2020	2.01%

The Morningstar Category is a group that Morningstar places a fund into based on their actual investment style (rather than their stated objectives). [1]

The International Securities Identification Number is used to uniquely identify a fund.

Fund Size is a measure of the total amount of cash and securities held in all classes of a fund, in millions of dollars. [22]

Share Class Size measures only the amount of cash and securities held in this specific class of the fund. [22]

The Max Initial Charge is the largest percentage fee the fund provider could charge upon purchase of the fund for administration.

The ongoing charge is the cost an investor in a fund can reasonably expect to pay the fund provider each year for management, audit and custody fees combined.

The Investment Objective is a fund manager's stated goal for the money invested in their fund, such as capital growth or steady income flows to investors.

Investment Objective: Pictet-Digital PUSD

The investment policy of this compartment aims to achieve capital growth by investing at least two thirds of its total assets or wealth in equities or any other securities related to securities issued by companies using digital technology to offer interactive services and/or products related to interactive services in the communications sector. The risks will be minimised by a balanced geographical spread in the portfolio, since the investment universe is not limited to a specific geographic region. The Compartment may invest up to 30% of its net assets in China A Shares through (i) the QFII quota granted to an entity of the Pictet Group, (ii) the RQFII quota granted to an entity of the Pictet Group (iii) the Shanghai-Hong Kong Stock Connect programme, (iv) the Shenzhen-Hong Kong Stock Connect programme, and/or (v) any similar acceptable securities trading programmes which may be available to the Compartment in the future as approved by the relevant regulators from time to time.

The Trailing Return is a performance figure that covers a rolling period. YTD means Year to Date and the annualised rate is the level of return over each period, compounding annually. Here the "3 Year Annualised" figure of 12.25% means that the fund has generated 12.25% return p.a. in the 3 years preceding 24/07/20.

Returns

Trailing Returns (GBP)	24/07/2020
YTD	15.29
3 Years Annualised	12.25
5 Years Annualised	17.83
10 Years Annualised	15.89

12 Month Yield	0.00

The 12 Month Yield is the percentage that the fund has paid investors as dividends over the last 12 months.

Management

Manager Name	Start Date
Sylvie Sejournet	30/06/2008
Olivier Djopwouo	01/10/2018
Click here to see others	
Inception Date	14/11/1997

[18]

[19]

Category Benchmark

Fund Benchmark

MSCI ACWI NR EUR

Morningstar Benchmark

MSCI World/Information Tech NR USD

The Morningstar Benchmark is an index that Morningstar believes the fund's performance should be measured against based on similarities in the composition of the fund and the index.

The Fund Benchmark, similar to the Morningstar benchmark, is an index that the *fund provider* believes its performance should be measured against.

Portfolio Profile for Pictet-Digital PUSD

30/06/2020

Morningstar Style Box® Morningstar Style Box [3]

Equity Style

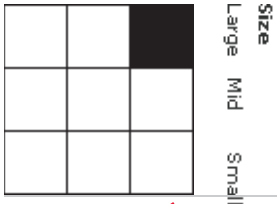
Asset Allocation Long [4] Short [5]

	% Long	% Short	% Net Assets
Stock	98.07	0.00	98.07
Bond	0.53	0.21	0.32

Asset allocation shows the distribution of investments in the fund between different categories of financial assets.

% Net Assets is how much of the funds total investment is held in the specific asset, here 98.07% of the fund is in Stocks.

Morningstar Style Box [3]



Property	0.00	0.00	0.00
Cash	5.82	4.21	1.61
Other	0.00	0.00	0.00

Top 5 Regions shows the top 5 geographies in which the fund is invested in percentage terms.

Top 5 Regions	%
United States	56.42
Asia - Emerging	14.12
Japan	10.86
Eurozone	5.33
Asia - Developed	5.24

Top 5 Sectors	%
Communication Services	61.11
Technology	19.16
Consumer Cyclical	17.17
Financial Services	2.41
Healthcare	0.15

Top 5 Sectors lists the sectors that the fund invests most heavily in.

Morningstar divides stocks into 12 sectors according to their primary business, grouped into three larger "super-sectors".
The Cyclical Group comprises:
- Basic Materials,
- Consumer Cyclical,
- Financial Services, and
- Real Estate.
The Defensive Group includes:
- Consumer Defensive,
- Healthcare, and
- Utilities.
And the Sensitive Group contains:
- Communication Services,
- Industrials,
- Energy, and
- Technology. [20]

Top 5 Holdings	Sector	%
Facebook Inc A	Communication Services	4.39
Comcast Corp Class A	Communication Services	3.53
Salesforce.com Inc	Technology	3.49
Alibaba Group Holding Ltd ADR	Consumer Cyclical	3.46
Baidu Inc ADR	Communication Services	3.36

Increase Decrease New since last portfolio [21]

The Top 5 Holdings are the 5 largest investments in the fund. In this case the 5 largest investments are all stocks. The sector of each of the holdings is in the right column.

Pictet-Digital PUSD

Growth Of 1000 (GBP) 30/06/2020

- Fund: Pictet-Digital PUSD
- Category: Sector Equity Technology
- Category Index: MSCI World/Information Tech NR USD

The Price Return is the percentage per annum rate of return on an investment in the fund over each period. eg. the 2019 price return means an investment at the start of 2019 would be worth 20.46% more at the end of the year.

Annual Returns (GBP) 30/06/2020

	2013	2014	2015	2016	2017	2018	2019	30/06
Price Return	37.05	10.80	12.78	29.21	25.18	-1.71	20.46	15.07
+/- Category	12.06	-3.64	4.21	1.30	-0.11	1.64	-9.65	-4.57
+/- Category Index	10.72	-12.48	1.95	-3.73	-1.08	-5.17	-21.40	-7.04
% Rank in Category	10	71	26	36	51	48	86	66

+/- Category shows the difference between the Price Return and the percentage p.a. return of the average fund in the same Morningstar category.
eg. In 2014 the average fund in the category returned 14.44%, -3.64 means that this fund performed at 10.8%.

+/- Category Index shows the fund's performance level in relation to the Morningstar Benchmark defined on the previous page.
This works similarly to the +/- Category score.

Trailing Returns (GBP) Trailing Returns means the same here as on the first page. 24/07/2020

	Total Returns	+/- Category	+/- Category Index
1 Day	-2.79	-0.25	-1.18
1 Week	-2.93	-1.72	0.14
1 Month	0.14	-2.93	-0.71

The % Rank in Category is the percentage of funds in the same Morningstar Category that outperformed the fund over the time period.

3 Months	17.31	-5.91	0.41
6 Months	8.83	-7.37	-2.54
YTD	15.29	-7.73	-4.44
1 Year	14.86	-13.12	-10.14
3 Years Annualised	12.25	-6.02	-11.40
5 Years Annualised	17.83	-3.82	-7.85
10 Years Annualised	15.89	0.35	-3.85

Category: Sector Equity Technology

Category Index: MSCI World/Information Tech NR USD

The Quarterly return figure is the percentage increase in the value of an investment in the fund over the defined quarter year. eg. an investment in this fund would have depreciated 9.4% in the first quarter of 2020.

Quarterly Returns (GBP) 30/06/2020

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2020	-9.40	27.00	-	-
2019	12.36	4.22	2.25	0.61
2018	-1.54	10.90	1.33	-11.18
2017	9.85	5.18	2.83	5.36
2016	1.42	12.78	14.87	-1.66
2015	9.15	-2.15	-6.61	13.06

Morningstar Return is an assessment of the fund's excess return over a risk-free rate (the return of the 90-day Treasury bill) in comparison to similar funds. [6]

Morningstar Risk is a measure of how much the fund has declined in value due to changing market conditions compared to other funds in the same Morningstar Category. The bottom 10% in the category are considered 'low risk', the next 22.5% 'below average', middle 35% 'average', next 22.5% 'above average' and final 10% 'high'.

Morningstar Rating™(Relative to Category) 30/06/2020

	Morningstar Return	Morningstar Risk	Morningstar Rating™
3-Year	Below Average	Low	★★★
5-Year	Average	Low	★★★
10-Year	Average	Low	★★★
Overall	Average	Low	★★★

The Morningstar Rating™ is a rating out of 5 stars based on how well the fund has performed in comparison to similar investments after adjusting for risk and accounting for all fees. The top 10% of investments receive five stars, the next 22.5% four stars, the middle 35% three stars, the next 22.5% two stars, and the bottom 10% receive one star.

Category : Sector Equity Technology Click here to see our Methodology

Volatility Measurements

The 3-Yr Standard Deviation is a measure of how much the funds returns have fluctuated in the past. It is calculated with the normal formula for standard deviation using the fund's monthly returns for the past 36 months.

3-Yr Std Dev	15.12 %	3-Yr Sharpe Ratio	0.90
3-Yr Mean Return	15.12 %		

The 3-Yr Sharpe Ratio is a measure of performance over the last 3 years adjusted for the level of risk of the investment. The Sharpe Ratio is calculated as the excess return (return above a treasury bill) divided by the standard deviation of the excess returns. A high Sharpe ratio (>1) indicates a relatively high return : risk ratio and >3 is considered excellent.

The 3-Yr Mean Return is the mean of the monthly performance figures, expressed on an annualised basis, for each of the past 36 months.

Modern Portfolio Statistics

	30/06/2020 Standard Index	30/06/2020 Best Fit Index
	MSCI World/Information Tech NR USD	NASDAQ Composite PR USD
3-Yr Beta	0.83	0.87
3-Yr Alpha	-7.29	-3.32

The 3-Yr Beta is a measure of a fund's sensitivity to market movements over the last 3 years. The beta of the market is 1.00 by definition. Here the beta of 0.83 shows that the fund has performed 17% worse than the MSCI World/IT index in up markets and 17% better in down markets, assuming all other factors remain constant. It is calculated as the covariance of the fund and market returns divided by the variance of the market returns.

The 3-Yr Alpha represents the amount of value the fund manager has added or removed compared to an investment in an index over the previous 3 years. It does not consider fees. Morningstar's calculation appears to also not consider the beta value.

Investment Style Details 30/06/2020

Morningstar Style Box®

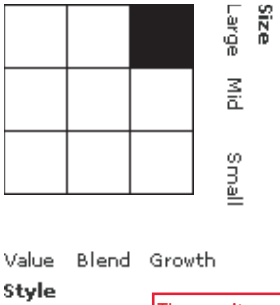
Equity Style

Morningstar Style Box [3]

Size		Rel to Cat
Average Mkt Cap (Mil)	USD 120047	-

The Investment Style - Average Market Capitalisation is the average size of a company which the fund is investing in.

Morningstar Style Box [3]



This Market Capitalisation table shows what percentage of the funds investments are held in companies of each size

Market Capitalisation	% of Equity
Giant	72.36
Large	20.32
Medium	6.26
Small	0.92
Micro	0.15

Giant-cap stocks are defined as those that account for the top 40% of the capitalization of each style zone; large-cap stocks represent the next 30%; mid-cap stocks represent the next 20%; small-cap stocks represent the next 7% and micro-cap stocks represent the smallest 3%.

The equity portfolio column lists the statistics for each of the rows for the proportion of investments in the fund that are in shares.

Valuations and Growth Rates	Equity Portfolio		Relative to Category
Price/Prospective Earnings [7]	22.55	(ratio)	0.77
Price/Book [8]	2.72	(ratio)	0.65
Price/Sales [9]	2.33	(ratio)	0.68
Price/Cash Flow [10]	9.31	(ratio)	0.62
Dividend-Yield Factor [11]	1.57	%/p.a.	1.50
Long-Term Projected Earnings Growth [12]	9.73	%/p.a.	0.77
Historical Earnings Growth [13]	3.34	%/p.a.	0.35
Sales Growth [14]	6.22	%/p.a.	0.97
Cash-Flow Growth [15]	6.61	%/p.a.	1.33
Book-Value Growth [16]	9.02	%/p.a.	1.12

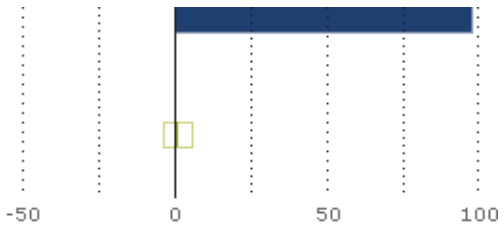
[17]

The relative to category statistic for each row shows how many times better or worse the fund performed than the average fund in it's Morninstar category on that measure.
For example this fund has 1.33 times the Cash-Flow Growth of the average Equity Technology fund.

Category: Sector Equity Technology

Asset Allocation

This Asset Allocation section is the same as in the summary on the first page. The graph shows the net asset allocation where % Short is represented by movement in the negative direction.



30/06/2020

	% Long	% Short	% Net Assets
Stock	98.07	0.00	98.07
Bond	0.53	0.21	0.32
Property	0.00	0.00	0.00
Cash	5.82	4.21	1.61
Other	0.00	0.00	0.00

World Regions

This World Regions section gives a comprehensive breakdown of the geographical areas where the funds investments are held.

30/06/2020

	% of Equity	Relative to Category
United States	56.42	0.82
Canada	0.78	1.46
Latin America	1.92	3.16
United Kingdom	1.82	0.83
Eurozone	5.33	0.69
Europe - ex Euro	0.00	0.00
Europe - Emerging	0.00	0.00
Africa	2.83	19.82
Middle East	0.68	1.85
Japan		

The Relative to Category column shows how much more or less the fund invests in a certain region than the average fund in the same Morningstar Category.
For example, this fund invests 19.82 times as much in Africa as the average Equity Technology Fund.

	10.86	2.04
Australasia	0.00	0.00
Asia - Developed	5.24	1.09
Asia - Emerging	14.12	2.38

Category: Sector Equity Technology

The Sector Weightings section shows how the fund's investments are spread between each of the 12 sectors.

Morningstar divides stocks into 12 sectors according to their primary business, grouped into three larger "super-sectors".
The Cyclical Group comprises:
- Basic Materials,
- Consumer Cyclical,
- Financial Services, and
- Real Estate.

The Defensive Group includes:
- Consumer Defensive,
- Healthcare, and
- Utilities.

And the Sensitive Group contains:
- Communication Services,
- Industrials,
- Energy, and
- Technology. [20]

Sector Weightings

30/06/2020

	% of Equity	Relative to Category
Consumer Cyclical	17.17	2.47
Financial Services	2.41	0.54
Healthcare	0.15	0.05
Communication Services	61.11	3.52
Technology	19.16	0.31

Category: Sector Equity Technology

The Relative to Category column shows how much more or less the fund invests in a certain sector than the average fund in the same Morningstar Category. For example, this fund invests 3.52 times as much in Communication Services as the average Equity Technology Fund.

Top 10 Holdings

30/06/2020

		Portfolio
Total Number of Equity Holdings	The number of companies the fund holds shares in.	55
Total Number of Bond Holdings	The number of unique bonds the fund holds.	46
Assets in Top 10 Holdings	The percentage of assets invested in the top 10 largest investments by the fund.	34.01

Name	Sector	Country	% of Assets
Facebook Inc A		United States	4.39
Comcast Corp Class A		United States	3.53
Salesforce.com Inc		United States	3.49
Alibaba Group Holding Ltd ADR		China	3.46
Baidu Inc ADR		China	3.36
Samsung Electronics Co Ltd		Korea, Republic Of	3.19
Alphabet Inc A		United States	3.18
eBay Inc		United States	3.15
Microsoft Corp		United States	3.13
AT&T Inc		United States	3.13

Increase Decrease New since last portfolio [21]

Category: Sector Equity Technology

The Legal Structure of a fund is based on the law in which the fund provider is domiciled. These can include Fonds Commun de Placement (FCP) in Luxembourg, Open-Ended Investment Companies (OEICs) in the UK and Société d'Investissement à Capital Variable (SICAVs) in continental Europe.

Management

Name of Company	Pictet Asset Management (Europe) SA	**Domicile**	Luxembourg
Phone	+352 467 171-1	**Legal Structure**	SICAV
Website	www.am.pictet	**UCITS**	Yes

Undertakings for Collective Investment in Transferable Securities (UCITS) refers to a European Union directive that establishes the terms under which a fund domiciled in one EU member state can be marketed in all EU countries.

Address	15, avenue J.F. Kennedy Luxembourg L-1855 Luxembourg
Inception Date	14/11/1997
Fund Advisor(s)	Pictet Asset Management S.A.
Fund Manager	Sylvie Sejournet
Manager Start Date	30/06/2008
Fund Manager	Olivier Djopwouo
Manager Start Date	01/10/2018
Fund Manager	Stanislas Effront
Manager Start Date	01/09/2018

The Max Initial Charge is the largest percentage fee the fund provider could charge upon purchase of the fund for administration.

The Max Annual Management Charge is the largest percentage fee the fund provider could charge as a yearly fee for management.

Fees and Expenses

Sales Charges (Maximum)		Annual Charges	
Max Initial Charge	5.00%	Max Annual Management Charge	2.40%
Max Exit Charge*	3.00%	Ongoing Charge	2.01%

The Max Exit Charge is the largest percentage fee the fund provider could charge upon selling the fund.

The ongoing charge is the cost an investor in a fund can reasonably expect to pay the fund provider each year for management, audit and custody fees combined.

Purchase Details

Minimum Investments

Initial	-
Additional	-
Savings	-

The minimum initial deposit into the fund.

The minimum deposit into the fund after an initial deposit.

Tax Free Savings Schemes

ISAs	Yes

In Individual Savings Account (ISA) is a type of tax advantaged investment available to residents of the UK.

E.1 Additional Footnotes for Morningstar Fund Summary Glossary

[1] Morningstar has around 130 fund categories, these are all listed at `www.morningstar.co.uk/uk/glossary/98381/morningstar-category.aspx`.

[2] The performance history graph shows the performance of the fund (red) compared to the average fund in the same Morningstar Category (orange) and the Category Benchmark fund (green). The graph on the first page shows the last 5 years, and the graph on the second page shows the last 10. Both graphs show how a 1,000 unit investment placed at the beginning of the period would develop until the current day.

On Morningstar's UK site, this graph is displayed in GBP, but can be viewed in other currencies in the 'Chart' tab of each fund listing.

[3] The Morningstar Style box (in this case the Equity Fund Style box – since this page was generated for a fund that does not pay dividends) shows the average market capitalisation of the companies that the fund invests in on the vertical axis. The 'Large' size includes companies with either a Giant or Large market capitalisation, the 'Mid' size includes companies with a Medium market capitalisation, and the 'Small' size includes the remaining Small and Micro companies.

The horizontal axis of the style box is an assessment of whether the fund invests more heavily in 'Value' or 'Growth' shares. Value investing involves purchasing shares in companies that the fund manager believes to be undervalued in order to capitalise on the increase in price when the value of the shares adjusts to reflect the true value. Many consider value investing safer than growth investing, since prices of value stocks tend to be less volatile. Growth investing involves selecting shares with a record of past growth and the potential for future increases in capital value. Usually, that means companies with high growth in earnings or expected earnings, and hence the potential for big increases in the stock price. If the company fails to deliver growth, the price can fall dramatically, hence growth investing is usually considered more risky than value investing.

[4] The long % is the percentage of assets in the fund that are in long positions. A long position is where shares are purchased with the goal of appreciating in value over time, or providing dividend income.

[5] The short % measures what percentage of a fund's assets are in short positions. A short position involves the fund borrowing a stock from a lender and immediately selling it. If the stock then depreciates in value, the fund manager can buy the stock back at a lower price, making a profit. The short % contributes negatively to the % net assets since revenue from stock in short positions has already been collected, but the cost of buying the stock back in the future has not yet been paid.

[6] In each Morningstar Category, the funds with returns in the top 10% earn a High Morningstar Return, the next 22.5% Above Average, the middle 35% Average, the next 22.5% Below Average, and the bottom 10% Low. Morningstar Return is measured for up to three time periods (three-, five-, and 10-years). These separate measures are then weighted and averaged to produce an overall measure for the fund.

[7] The Price/Prospective Earnings ratio is effectively a measure of how willing investors are to pay for a share compared to what they expect to earn from the investment. It is calculated as $\frac{\text{Market Value Per Share}}{\text{Forecast Earning Per Share}}$.

[8] The Price/Book ratio compares the funds market capitalisation to its book value on a per-share basis, where the book value is the difference between the fund's total assets and total liabilities divided by the number of shares. The price/book ratio is the ratio of the cumulative value of peoples investments in the fund to the actual amount of assets that the fund holds. A company trading at several times its book value tends to indicate a growth stock where investors believe the book value will rise in the future. Typically a company with a low P/B means that investors think that the firm's assets have been too highly valued on its financial statements.

[9] The Price/Sales ratio is the ratio of the price of purchasing a unit of the fund to the revenue that the single unit will make. The Price/Sales ratio shows how much investors are willing to pay per dollar of revenue from the fund.

[10] The Price/Cash Flow ratio is the ratio of the Market Capitalisation of a fund to its Operating Cash Flow (the revenue from operating activities plus return on investments minus any taxes).

[11] The Dividend Yield Factor for a stock is the percentage of its stock price that a company is projected to pay out as dividends. It is calculated by dividing estimated annual dividends per share for the current fiscal year by the company's most recent month-end stock price. This is one of the five value factors used to calculate the Morningstar Style Box.

[12] The long-term projected earnings growth rate summarizes stock analysts' estimates for how quickly a company will grow its earnings per share. This measure helps Morningstar determine how strong the overall growth-orientation is for a stock or portfolio and is one of the five growth factors used to calculate the Morningstar Style Box.

[13] The historical earnings growth rate for a stock is a measure of how the stock's earnings per share has grown over the last five years. The historical earnings growth rate can tell investors how quickly a company's profits are growing. A company may increase its earnings per share by increasing its sales, decreasing its costs, or reducing the number of shares outstanding in the marketplace. This is one of the five growth factors used to calculate the Morningstar Style Box.

[14] The sales growth rate for a stock is a measure of how the stock's sales per share (the revenue made from a single share over time) has grown over the last five years. Sales growth tells an investor how quickly a company is increasing its revenues. Sales growth is one of the five growth factors used to calculate the Morningstar Style Box.

[15] The cash flow growth rate for a stock is a measure of how the stock's cash flow per share (the net income of the fund divided by the amount of shares) has grown over the last three to five years. Cash flow growth tells an investor how quickly a company is generating inflows of cash from operations. Cash flow growth is one of the five growth factors used to calculate the Morningstar Style Box.

[16] The book value growth rate for a stock is a measure of how the stock's book value per share has grown over the last five years. Book value growth tells an investor how quickly a company is building its asset base. A company may increase its book value by buying more assets or decreasing its liabilities. Book value growth is one of the five growth factors used to calculate the Morningstar Style Box.

[17] The coloured lines link the related valuations and growth rates. The Price/Prospective Earnings valuation is related to the Historical and Long-Term Projected Earnings Growth, the Price/Book ratio is related to the Book-Value Growth, the Price/Sales ratio is related to the Sales Growth, and the Price/Cash Flow ratio is linked to the Cash-Flow Growth. The Dividend-Yield Factor is not directly related to a listed growth rate.

[18] The manager start date the date the manager began running the fund.

[19] The Inception date is the date the fund was formed and became available for sale to unit holders.

[20] Morningstar goes into more detail about their sectors in this document `https://www.morningstar.com/content/dam/marketing/apac/au/pdfs/Legal/StockSectorStructure_Factsheet.pdf`.

[21] The Increase, Decrease, and New Since Last Portfolio symbols appear to the left of each of the fund's holdings and indicate whether the fund has purchased more of the stock, sold a portion of it, or if it was unowned at the time the fund previously released data about their holdings.

[22] A mutual fund is often divided into many classes, where each class of a fund invests in the same portfolio of securities and has the same investment objectives and policies. But each class has different fees and/or expenses and may report its performance in different currencies.

3 Year R-Squared – The 3 year R-Squared statistic of a fund indicates how closely correlated the fund's performance is with the performance of the Morningstar Category's Benchmark index. An R-squared of 100 means that all variations in the value of the fund can be explained by movements in the benchmark index, conversely a value of 0 would indicate that the performance of the fund is not at all correlated to the performance of its benchmark index.

Synthetic Risk and Reward Indicator (SRRI) – The SRRI is a measure of the volatility of a fund estimated from the historical weekly returns of the fund over a period of at least one year. An SRRI will correspond to an integer designed to rank the fund on a scale from 1 to 7, according to its increasing level of volatility. It can be found on the Key Investor Information Document (KIID) released by each fund.

More information on calculating the SRRI can be found at `https://www.esma.europa.eu/sites/default/files/library/2015/11/10_673.pdf`.

Appendix F

Morningstar ETF Summary Glossary

This appendix shows the standardised pro forma used by fund managers and adopted by Morningstar to show data related to an ETF. Morningstar offers this document for each ETF in their database, and this summary has been annotated with definitions of the terms and concepts it contains.

The items which overlap with the mutual fund summary document are not redefined in this appendix.

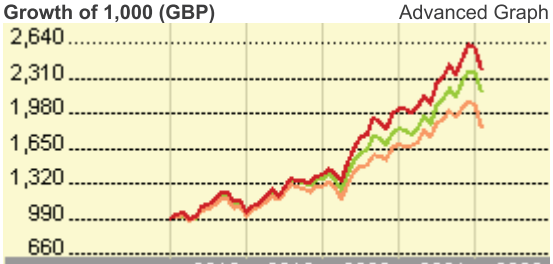
Missing information is unchanged from the Morningstar Mutual Fund Summary Glossary

iShares NASDAQ 100 UCITS ETF USD (Acc) | CSNDX

The closing price (provided for a specific date) is the price at which the ETF was trading at the end of the specified trading day. The closing price may diverge slightly from the NAV of the fund.

Performance History 31/01/2022

Growth of 1,000 (GBP) Advanced Graph



	2018	2019	2020	2021	2022
Fund	5.7	33.4	43.6	28.1	-7.6
+/-Cat	3.4	6.2	12.5	6.2	2.4
+/-B'mrk	1.1	2.3	9.4	-0.6	0.1

Category: US Large-Cap Growth Equity

Category Benchmark: Russell 1000 Growth TR USD

Key Stats

Closing Price 04/02/2022	USD 825.20
Day Change	1.95%
Morningstar Category™	US Large-Cap Growth Equity
Volume	6548
Exchange	SWISS EXCHANGE
ISIN	IE00B53SZB19
Fund Size (Mil) 04/02/2022	USD 8315.42
Share Class Size (Mil) 04/02/2022	USD 8066.02
Ongoing Charge 02/02/2022	0.33%

The amount of shares in the fund that were traded on the day that the closing price was measured

The stock exchange on which the fund is traded

The expected yearly percentage fee

* This rating and report were issued for a different share class of this fund. The performance and fee structure of this class may vary from that referenced.

Morningstar Research

Click here to read this analyst report on the underlying fund.

Sustainability

Sustainability Rating

A measurement out of 5 (globes) of how effectively the fund meets environmental, social, and corporate governance (ESG) challenges. Calculated relative to funds in the same Morningstar category.

The average ESG score of each of the constituents of the fund, weighted by the percentage of the funds holdings in the company.

The average ESG risk of each of the regions invested in by the fund. Weighted by the proportion of assets invested in the region.

Corporate Sustainability Contribution

100%

Sovereign Sustainability Contribution

0%

The number of alternative investment options (of the same type - ETFs) in the same Morningstar category.

Number of Investments in Global Category

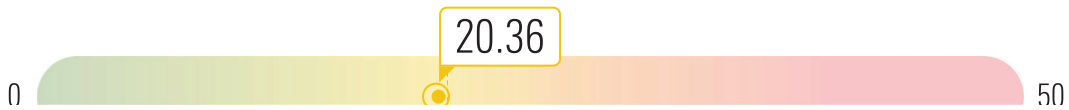
1,567

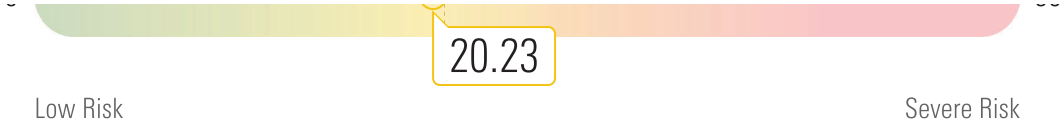
Sustainable Investment

No

A binary indicator of whether Morningstar recommends the fund as a sustainable investment.

Corporate Sustainability Score ● Historical ○ Current ⋮ Global Category Average (Historical)





Sovereign Sustainability Score ⋮ Global Category Average (Historical)

Corporate ESG Pillars (lower scores = lower risk)

2.78	9.87	7.59	0.00
Environmental	**Social**	**Governance**	**Unallocated**

Current Sustainability Score based on 99.54% of Corporate AUM and — of Sovereign AUM | Global Category: US Equity Large Cap Growth | Sustainability Score and Sustainability Rating as of 30 Nov 2021. Portfolio as of 30 Nov 2021. Sustainalytics provides issuer-level ESG Risk analysis used in the calculation of Morningstar's Sustainability Score. Sustainable Investment Mandate information is derived from the fund prospectus.

Investment Objective: iShares NASDAQ 100 UCITS ETF USD (Acc) | CSNDX

The investment objective of the Fund is to deliver the net total return performance of the Benchmark Index (being the NASDAQ 100 Index), less the fees and expenses of the Fund.

Returns

Trailing Returns (GBP)	04/02/2022
YTD	-9.85
3 Years Annualised	27.39
5 Years Annualised	21.95
10 Years Annualised	21.87
12 Month Yield	0.00

Management

Manager Name	Start Date
Not Disclosed	26/01/2010
Inception Date	26/01/2010

Category Benchmark

Fund Benchmark
NASDAQ 100 NR USD

Morningstar Benchmark
Russell 1000 Growth TR USD

Portfolio Profile for iShares NASDAQ 100 UCITS ETF USD (Acc) | CSNDX

03/02/2022

Morningstar Style Box®
Equity Style

Asset Allocation

	% Long	% Short	% Net Assets
Stock	99.87	0.00	99.87
Bond	0.00	0.00	0.00
Property	0.00	0.00	0.00

Cash	0.13	0.00	0.13
Other	0.00	0.00	0.00

Top 5 Regions	%
United States	97.78
Asia - Emerging	1.46
Eurozone	0.39
Latin America	0.38
Canada	0.00

Top 5 Sectors	%
Technology	48.94
Communication Services	18.37
Consumer Cyclical	15.13
Healthcare	5.86
Consumer Defensive	5.51

Top 5 Holdings	Sector	%
Apple Inc	Technology	12.72
Microsoft Corp	Technology	10.14
Amazon.com Inc	Consumer Cyclical	6.32
Alphabet Inc Class C	Communication Services	4.07
Tesla Inc	Consumer Cyclical	4.02

⊕ Increase ⊖ Decrease ☆ New since last portfolio

iShares NASDAQ 100 UCITS ETF USD (Acc) | CSNDX

Growth Of 1000 (GBP) 31/01/2022

Fund: iShares NASDAQ 100 UCITS ETF USD (Acc) | CSNDX

Category: US Large-Cap Growth Equity

Category Index: Russell 1000 Growth TR USD

Annual Returns (GBP) 31/01/2022

	2015	2016	2017	2018	2019	2020	2021	31/01
Price Return	15.51	27.29	20.89	5.75	33.41	43.60	28.12	-7.64
+/- Category	6.82	5.02	4.96	3.40	6.19	12.45	6.21	2.39
+/- Category Index	3.73	-0.43	1.95	1.14	2.29	9.38	-0.65	0.07
% Rank in Category	12	22	21	29	10	19	20	30

Trailing Returns (GBP) 04/02/2022

	Total Returns	+/- Category	+/- Category Index
1 Day	1.95	2.07	0.07
1 Week	0.80	-1.82	-0.17
1 Month	-9.58	1.53	-0.43
3 Months	-10.30	3.12	-0.84
6 Months	0.30	6.43	-0.61
YTD	-9.85	2.01	-0.33

1 Year	9.66	6.58	-2.43
3 Years Annualised	27.39	8.78	3.26
5 Years Annualised	21.95	6.01	2.05
10 Years Annualised	21.87	5.30	2.42

Category: US Large-Cap Growth Equity

Category Index: Russell 1000 Growth TR USD

Quarterly Returns (GBP) 31/01/2022

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2021	0.71	11.11	3.46	10.66
2020	-4.27	30.60	7.52	6.83
2019	14.11	6.60	4.48	4.98
2018	-0.63	13.84	9.83	-14.88
2017	10.63	0.17	2.66	6.26

Morningstar Rating™(Relative to Category) 31/12/2021

	Morningstar Return	Morningstar Risk	Morningstar Rating™
3-Year	High	Above Average	★★★★★
5-Year	High	Above Average	★★★★★
10-Year	High	Above Average	★★★★★
Overall	High	Above Average	★★★★★

Category : US Large-Cap Growth Equity

Click here to see our Methodology

Volatility Measurements 31/01/2022

3-Yr Std Dev	16.86 %	3-Yr Sharpe Ratio	1.59
3-Yr Mean Return	30.70 %		

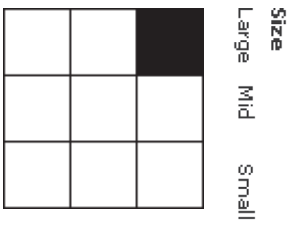
Modern Portfolio Statistics 31/01/2022 31/01/2022

	Standard Index	Best Fit Index
	Russell 1000 Growth TR USD	NASDAQ 100 PR USD
3-Yr Beta	1.00	1.00
3-Yr Alpha	2.72	0.44

Investment Style Details 03/02/2022

Morningstar Style Box®

Equity Style



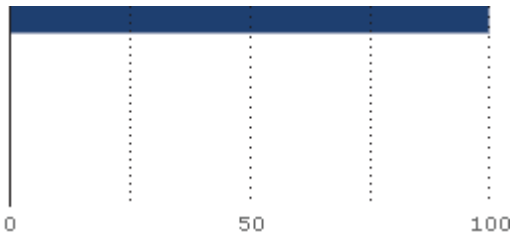
Size		Rel to Cat
Average Mkt Cap (Mil)	USD 401488	-

Market Capitalisation	% of Equity
Giant	61.48
Large	33.08
Medium	5.44
Small	0.00
Micro	0.00

Valuations and Growth Rates	Equity Portfolio	Relative to Category
Price/Prospective Earnings	26.51	0.87
Price/Book	6.56	1.00
Price/Sales	4.24	0.97
Price/Cash Flow	16.70	0.84
Dividend-Yield Factor	0.71	1.24
Long-Term Projected Earnings Growth	15.98	1.00
Historical Earnings Growth	15.81	0.79
Sales Growth	15.20	1.81
Cash-Flow Growth	19.52	1.41
Book-Value Growth	13.92	1.24

Category: US Large-Cap Growth Equity

Asset Allocation 03/02/2022



	% Long	% Short	% Net Assets
Stock	99.87	0.00	99.87
Bond	0.00	0.00	0.00
Property	0.00	0.00	0.00
Cash	0.13	0.00	0.13
Other	0.00	0.00	0.00

World Regions 03/02/2022

	% of Equity	Relative to Category
United States	97.78	1.01
Canada	0.00	0.00
Latin America	0.38	2.40
United Kingdom	0.00	0.00
Eurozone	0.39	0.61
Europe - ex Euro	0.00	0.00
Europe - Emerging	0.00	-
Africa	0.00	-
Middle East	0.00	0.00
Japan	0.00	-
Australasia	0.00	-
Asia - Developed	0.00	0.00
Asia - Emerging	1.46	3.21

Category: US Large-Cap Growth Equity

Sector Weightings 03/02/2022

	% of Equity	Relative to Category
Consumer Cyclical	15.13	1.01

Financial Services	1.08	0.12
Consumer Defensive	5.51	1.52
Healthcare	5.86	0.41
Utilities	1.07	2.31
Communication Services	18.37	1.26
Industrials	4.04	0.73
Technology	48.94	1.44

Category: US Large-Cap Growth Equity

Top 10 Holdings

03/02/2022

Portfolio NEW

Total Number of Equity Holdings	102
Total Number of Bond Holdings	0
Assets in Top 10 Holdings	52.29

Name	Sector	Country	% of Assets
Apple Inc		United States	12.72
Microsoft Corp		United States	10.14
Amazon.com Inc		United States	6.32
Alphabet Inc Class C		United States	4.07
Tesla Inc		United States	4.02
Alphabet Inc Class A		United States	3.86
NVIDIA Corp		United States	3.78
Meta Platforms Inc Class A		United States	3.78
Adobe Inc		United States	1.80
PepsiCo Inc		United States	1.80

⊕ Increase ⊖ Decrease ☆ New since last portfolio

Category: US Large-Cap Growth Equity

Management

Name of Company BlackRock Asset Management Ireland - ETF

Phone -

Website www.blackrock.com

Address 1st Floor
Dublin D04 YW83
Ireland

Domicile Ireland

Legal Structure Open Ended Investment Company

UCITS Yes

Inception Date 26/01/2010

Fund Advisor(s)
BlackRock Advisors (UK) Limited

Fund Manager Not Disclosed

Manager Start Date 26/01/2010

Fees and Expenses

Sales Charges (Maximum)

Max Initial Charge	n/a
Max Exit Charge	n/a

Annual Charges

Max Annual Management Charge	0.33%
Ongoing Charge	0.33%

Purchase Details

Minimum Investments

Initial	-
Additional	-
Savings	-

Tax Free Savings Schemes

ISAs	No

Appendix G

List of Downloaded Fund Attributes

For a definition of any of the below terms, see Appendix E.

G.1 Attributes Used for Automatic Selection

Total 25 attributes.

- fund size (M)
- fund size currency
- inception date
- 1Y total return
- 3Y annualised return
- 5Y annualised return
- 10Y annualised return
- 1Y +/- category
- 3Y +/- category
- 5Y +/- category
- 10Y +/- category
- 1Y +/- category index
- 3Y +/- category index
- 5Y +/- category index
- 10Y +/- category index
- 3Y Morningstar rating
- 5Y Morningstar rating
- 10Y Morningstar rating
- overall Morningstar rating
- 3Y Sharpe ratio
- 3Y alpha (standard index)
- 3Y beta (standard index)
- Morningstar Medalist Rating
- ongoing charge
- minimum initial investment [1]

G.2 Attributes for Manual Selection

Total 9 attributes.

- 12M yield
- manager start date
- Morningstar benchmark
- 3Y alpha (best fit index)
- max annual charge
- max exit charge
- max initial charge
- minimum initial investment
- fund benchmark

G.3 Information Attributes

Total 14 attributes.

- legal name
- NAV
- NAV currency
- Morningstar Category
- share class size (M)
- share class size currency
- 3Y standard deviation
- 3Y mean return
- 3Y beta (best fit index)
- P/E ratio
- P/E ratio (relative to category)
- dividend-yield factor
- dividend-yield factor (rel. to cat.)
- ISAs

[1] The minimum initial investment is preliminarily used during automatic selection, but is also considered manually.