2002

Are SRI funds different from non-SRI funds, from a financial asset perspective?: Evidence from some Australian SRI funds

Ingebjørg Kristoffersen
Edith Cowan University

Edith Cowan University

Copyright Warning

USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

COPYRIGHT AND ACCESS DECLARATION

University Policy upholds the literary rights of the candidate with respect to the content of the thesis, notwithstanding the University retaining ownership of all copies of a thesis, which have been submitted.

Are SRI Funds Different from Non-SRI Funds, from a Financial Asset Perspective?

♦

Evidence from some Australian SRI funds

Ingebjørg Kristoffersen

Honours Thesis

Faculty of Business, School of Finance and Business Economics

Edith Cowan University
Perth
Western Australia

Submitted 16. April 2002

Abstract

Socially Responsible Investment (SRI) has seen a remarkable growth in recent years – primarily in the US and UK, but also in other markets including Australia. This growth, along with the development of corporate social responsibility, is suggested to be a result of increased awareness in social, environment and human rights issues. The literature offers several suggestions as to how SRIs and SRI funds may differ from other investments, as financial assets. It has been suggested that SRIs are more likely to represent smaller stocks, and also more likely represent growth rather than value stocks compared to non-SRIs. Furthermore, different hypotheses are presented on whether SRIs are likely to give higher or lower returns than other investments. Such assumptions have implications for portfolio diversification in regards to SRI funds. This study investigates whether there is evidence to support the assumption that Australian SRI funds are different, from a financial asset perspective, compared to non-SRI funds.

A sample of six general and four superannuation SRI funds is surveyed, and compared to a general managed fund benchmark index and a superannuation fund benchmark index. A four-factor Jensen alpha is used to assess fund performance, providing little evidence of any consistent and significant differences in returns between SRI funds and the respective benchmark indices. Returns-based style analysis is applied in order to detect differences between the SRI funds and the benchmark indices in exposures to asset classes and industry sectors. The results show little notable consistent patterns of differences in investment style, but provide mild support to the assumption of SRI funds having heavier exposures to smaller stocks. Also, the SRI funds tend to have higher exposures to cash compared to the relevant benchmark indices.

The most prominent result from the study is that the SRI funds differ markedly amongst themselves in terms of exposures to asset classes and industry sectors. They can therefore not be categorised under any particular investment style category, and should not be treated as a homogenous asset class.

Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

(i) incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education;

(ii) contain any material previously published or written by any other person except where due reference is made in the text; or

(iii) contain any defamatory material.

Perth, April 16th 2001

Ingebjørg Kristoffersen

Acknowledgements

I wish to thank my supervisors, Marilyn Clark-Murphy, and especially Paul Gerrans, for outstanding support, help and encouragement throughout all stages of preparing this thesis. Without their guidance and technical expertise, this thesis would not have seen the light of day

CONTENTS

1. INTRODUCTION 1

1.1 THE PURPOSE OF THIS STUDY 3
1.1.1 Hypotheses to be tested 3
1.1.2 Why is this important? 3
1.2 BACKGROUND TO THE STUDY – THE DEVELOPMENT OF A NEW INDUSTRY 4
1.2.1 What is Socially Responsible Investment? 4
1.2.2 Screening practices 6
1.2.3 The evolution of socially responsible investing 8
1.2.4 The recent growth in the SRI industry 11
1.2.5 SRI in Australia 13

2. A REVIEW OF THE AVAILABLE LITERATURE ON SRIs 15

2.1 SRI AND FINANCE THEORY 15
2.1.1 SRIs and investor behaviour 15
2.1.2 SRIs and CSR – The individual firms' perspective 18
2.1.3 SRI funds and portfolio theory 22
2.2 EMPIRICAL STUDIES: THE PERFORMANCE OF SRIs 25
2.2.1 Empirical studies on the financial characteristics and relative performance of socially responsible firms 25
2.2.2 Studies on the relative performance of typically excluded or included stocks 27
2.2.3 Empirical studies on SRI funds 30

3. A REVIEW OF THE LITERATURE ON FUND PERFORMANCE MEASURES AND STYLE ANALYSIS 35

3.1 PORTFOLIO PERFORMANCE MEASURES 35
3.1.1 The Jensen measure 36
3.1.2 Limitations of the Jensen-alpha performance measure 37
3.2 STYLE ANALYSIS 38
3.2.1 About style analysis 38
3.2.2 Does style matter? 43
3.2.3 How may style analysis contribute to the understanding of SRI funds? 44
3.2.4 Limitations of style analysis 44

4. METHODOLOGY AND ANALYSIS OF THE RESEARCH UNDERTAKEN 46

4.1 THE SRI FUNDS AND THE BENCHMARK INDICES INCLUDED IN THE ANALYSIS 46
4.2 PRELIMINARY OBSERVATIONS 47
4.3 ASSESSING FUND PERFORMANCE – THE JENSEN ALPHA 50
4.3.1 Model specification and data collection 50
4.3.3 Model-specific limitations 58
4.4 ASSESSING RISK BY EXPOSURE 59
4.4.1 Style analysis with asset classes as explanatory variables 60
4.4.2 Style analysis with industry sectors as explanatory variables 72

5. CONCLUSION 86

6. REFERENCES 90

7. APPENDICES 95

7.1 DATA USED FOR CONSTRUCTING THE VERY SMALL ORDINARIES INDEX 95
7.2 MORE OBSERVATIONS FROM THE FULL SPECIFIC INDUSTRY TABLE 95
7.3 CORRELATION MATRICES 97
7.3.1 Bilateral correlations between variables in the style analysis 97
7.3.2 Bilateral correlations between the variables in the style by broad industries analysis 97
7.3.3 Bilateral correlations between the variables in the style by specific industries analysis 98

LIST OF FIGURES

Figure 1 – The ways in which environmental responsibility may impact on firm value 21
Figure 2 – The relative performance of the Australian alcohol and tobacco industry 29
Figure 3 – Industry sectors grouped by alignment with sustainability 72
Figure 4 – ASX sub-indices grouped by alignment with sustainability 79

LIST OF TABLES

Table 1 – Australian SRI funds and benchmark indices included in the study 48
Table 2 – Australian SRI funds: Average monthly returns 49
Table 3 – Factors included in the Jensen measure and proxies 52
Table 4 – Jensen alphas calculated using the "small" proxy 54
Table 5 – Jensen alphas calculated using the "very small" proxy 55
Table 6 – Percentile splits for market capitalisation 61
Table 7 – Factors included in the style by asset class analysis and proxies 62
Table 8 – Style analysis : Asset classes 65
Table 9 – Broad industry sectors: Market capitalisation from 1998-2000 74
Table 10 – Style analysis: Broad industry sectors 75
Table 11 – Specific industry sectors: Market capitalisation from 1998-2000 78
Table 12 – Style analysis: Specific industry sectors 80
Table 13 – Style analysis: Self-constructed industry groupings by alignment with sustainability 82

Table I – S&P/ASX 300 proportions 95
Table II – Bilateral correlations between variables included in the style analysis 97
Table III – Bilateral correlations between variables included in the style by broad industries analysis 97
Table IV – Bilateral correlations between variables included in the style by specific industries analysis 98

1. INTRODUCTION

Socially Responsible Investment (SRI) is far from a new concept. The active selection of where funds are allocated based on social, religious, and/or environmental criteria has been practiced for decades by religious, educational and other similar institutions as well as by individuals. The development of these investments from being a niche activity to becoming more mainstream is however fairly recent, and at different stages of maturity in different markets. The U.S. market arguably represents one where SRI has now reached maturity and is widely available to the public. The U.S. SRI industry is supported by a strong information infrastructure compared with other markets where the industry is still in the early stages of development (Shapiro, 1992; The Allen Group, 2000 [1]).

While the SRI industry in the UK and Europe is at a stage of development closely following the US, Australia represents a market where SRI has only just started to gain foundations amongst investors, their advisers and fund managers. This "delay" in development has been blamed partly on the smaller market compared to the US, the UK and Europe (Birkensleigh, Proske, Kazakoff and Kendrick, 2000; The Allen Group, 2000).

A distinction between what has been called first and second generation socially responsible investors has been suggested when describing the development of socially responsible investing. Whilst the first generation of socially responsible investors might have been more likely to be willing to accept greater risks and lower returns compared to other investments, the second generation of these investors cannot so easily be described in this way (The Allen Group, 2000). Research has revealed that a larger proportion of today's socially responsible investors are expecting similar risks and returns from their Socially Responsible Investments (SRIs) as they do from other comparable investments (Beal and Goyen, 1998).

[1] The heavy reliance on the report written by The Allen Group in this paper stems from the limited existing literature on SRI, especially with particular reference to the Australian market. This report arguably provides the most comprehensive report to date on this topic, and thus represents an important source of information.

The so-far developed theory on SRI does, however, provide some reasons why screened investments may differ from non-screened investments, as financial assets. There are two contradictory hypotheses on how screened investments may perform differently from un-screened investments. The "green-penalty" assumption holds that "the bad guys make more money than the good guys", whereas the "green-dividend" hypothesis hold exactly the opposite, namely that there are financial rewards for corporate social responsibility (Gottsman and Kessler, 1998). It has also been suggested that SRIs may have different style-characteristics, and that these investments are more likely to be smaller market capitalisation stocks, and also more likely to have lower book-to-market value (i.e. they are more likely to be classified as growth stocks) (Kurtz, 1997). Screened funds may also incur higher diversifiable risk than non-screened funds due to a smaller investable universe (Anderson, 2000).

Whilst some research has been provided on the performance of SRI funds, as well as a few other aspects of such investments, most of this has applied to the U.S. market (e.g. Teper, 1992; Guerard, 1997; Gottsman and Kessler, 1998). Also, there are some potential problems in this line of research, in particular with regards to comparability of benchmarks. Some research has been undertaken on whether socially responsible corporate management leads to better market performance (e.g. Angel and Rivoli, 1997; Feldman, Soyka and Ameer, 1997; McGuire, Sundgren and Schneeweis, 1988). Very little such research has been undertaken for Australian SRI funds, although this is perhaps rather due to a lack of well-established SRI funds than a lack of interest. It is difficult to draw reliable conclusions about fund performance without a reasonable history of fund returns on which to base such research. Whilst the literature on SRI fund performance is presently in its early stages of development, there are considerable areas to be explored. No empirical work has been done on style characteristics of these funds, in spite of several suggestions having been made in the so-far developed theory.

1.1 The purpose of this study

1.1.1 Hypotheses to be tested

This study investigates the market behaviour of ten Australian SRI funds, six ordinary managed Australian equity SRI funds and four superannuation Australian equity SRI funds. The benchmark used for the general funds and the superannuation funds are the Morningstar Australian Equity Trusts – General (MAETG) and the Morningstar Superannuation Australian Equity – General (MSAEG) indices, respectively.

The objective of this study is to investigate whether there is sufficient evidence to support the hypothesis that SRI funds, as financial assets, behave differently to other comparable managed funds in the market. Evaluating the relative performance of these funds is not of primary interest in this study, but is reported as very few previous studies exist. Rather, the style analysis of the included SRI funds is the primary issue, and will provide indicators of the funds' exposure to asset classes and market sectors. The specific hypotheses to be tested are therefore:

H_01: Raw returns and variances are the same for SRI funds as for comparable non-SRI funds;

H_02: Risk-adjusted performance is the same for SRI funds as for comparable non-SRI funds; and

H_03: SRI fund exposures to asset classes and investment styles are consistent with the MAETG and MSAEG indices.

1.1.2 Why is this important?

It is important that SRI funds are marketed and treated as what they are from a financial asset perspective. However, the available literature reveals investors,

professionals and academics offering greatly differing descriptions of the attributes of such funds.

One important question arising from reviewing the available literature is whether SRIs and SRI funds represent a specific "asset-class" distinguished from other investments in terms of return, variability of returns and other fundamental financial measures, i.e. whether SRIs represent a homogenous group of investments in terms of style. The literature presents various attempts to categorise SRIs under a separate asset class or investment style, but with differing results as to *what* asset class or style.

There is an urgent need for empirical research on the financial characteristics and behaviour of such investments. This is particularly important for the superannuation members, due to the importance of these funds to individuals.

SRI fund performance has been evaluated with differing degrees of reliability and using a wide variety of methods. This study provides a framework and evidence from a sample of the existing Australian SRI funds, particularly in terms of investment style, which is an area largely unexplored in empirical studies on SRI.

1.2 Background to the study – the development of a new industry

1.2.1 What is Socially Responsible Investment?

SRI is defined differently by different sources and among academics, fund managers and other professionals. Whilst the terminology includes concepts such as "ethical investment", "green investment", "environmentally screened investment", and "social investing", 'SRIs' appears to be a more general term for investments that are screened using ethical, social and environmental criteria.

Shapiro (1992 p. 10) defines socially responsible investing simply as "the practice of making investment decisions based on both financial and social performance" as well as "the concept of investing in concert with your principles".

FTSE4Good (2001) defines socially responsible investment as "an investment strategy that takes into account a company's ethical, social and environmental performance as well as its financial performance".

The Ethical Investment Association (EIA) provides one definition of ethical investments and one of SRIs. Ethical investment "gives investors a choice, enabling them to make investment decisions without compromising their own ethical concerns". Socially responsible investments are defined as "integrating personal values and societal concern with investment decisions"[2] (The Ethical Association Newsletter, February 2001 p. 2).

Ellman (1997) distinguishes between two other types of socially responsible investing. Ethical investing, also referred to as socially-screened investing, is defined as "the placement of money in mutual funds, stocks, bonds or other securities or other investments that are screened to reflect ethical, environmental, social, political or moral values." Ethical investing is distinguished from alternative investing [3], which is defined as "the placement of money in businesses or investments reflecting a vision of an alternative kind of economy".

Tower Managed Funds (2001) addresses potential socially responsible investors, and defines socially responsible investing as being "about integrating your values with your investment decisions".

[2] EIA further suggest "SRI considers both the investors financial needs and an investment's impact on society". EIA states that the term SRI is commonly used in America and Europe, and that in Australia this term is used interchangeably with ethical investment (The Ethical Investment Association, February 2000 p. 2).

[3] Alternative investors are suggested to "generally place money in co-operative or community-oriented enterprises such as worker or consumer co-ops, co-operatively-owned financial institutions, regional development bonds, not-for-profit enterprises or community loan funds. Alternative investors want their investments to help create local jobs, develop local enterprises, provide essential service or empower workers or consumers" (Ellman, 1997).

1.2.2 Screening practices

The criteria on which SRIs are selected are typically referred to as investment screens. The industry distinguishes between positive and negative screens. Screening typically falls under social, environmental, human rights, or political criteria. Other selection procedures include Targeted Funds and Best-of-Sector approach, which both represent forms of positive screening. These approaches are described hereunder.

Negative screens

Negative screens are selection criteria where fulfillment of these implies *exclusion* from the portfolio. These avoidance-criteria typically include involvement in industries such as the tobacco, alcohol, gaming, armaments, nuclear power and uranium mining and pornography industry. Other than involvement in particular industries negative screens may exclude investments in organisations representing undesirable business practices, such as polluters or organisations with questionable labour ethics (The Allen Group, 2000; The Ethical Investment Association Newsletter, 2001; Anderson, 2000).

Positive screens

Positive screens are selection criteria where fulfillment of these implies *inclusion* into the portfolio. This is a more proactive approach, typically aiming to include sectors such as education, health, public transport and renewable energy. Positive screens may also apply to individual firms where firms with particularly good records on areas such as labour ethics, environmental consideration, and community involvement are included into the portfolio (The Allen Group, 2000; The Ethical Investment Association Newsletter, 2001; Anderson, 2000).

SRI fund managers are likely to use multiple screens and both negative and positive screening. Negative screens have, however, historically been the most

commonly used. They are also arguably easier and less costly (in terms of information requirements) to implement. It is recommended fund managers use both, and that promoting and encouraging companies that are more proactively involved with corporate social responsibility, and social and environmental issues in general, is important and should be a part of the objectives of SRI implementation (Waddock and Graves, 2000).

Targeted Funds

Targeted Funds invest in companies involved in particular industries or with a particular line of business. An example of this may be funds investing in renewable energy stocks (Saleeba and Proske, 2000).

Best-of-Sector

The Best-of-Sector approach is a type of a positive screen where the best performing companies, based on set social, environmental or ethical criteria, in every industry are included into the portfolio. This approach ensures that all industries are represented in the portfolio so as to eliminate potential risk associated with over and under-exposure to industries (The Allen Group, 2000; The Ethical Investment Association Newsletter, 2001; Anderson, 2000).

Potential problems with screening

Problems with negative and positive screens may arise in a number of areas. Problems of increased and unjustifiable information-costs may arise in markets where corporate transparency is low and ability to obtain information on where companies derive their revenues is limited. This problem will be less potent in markets with a more comprehensive infrastructure for information related to companies and SRI criteria, such as that emerging in the US and also in Europe (The Allen Group, 2000). The Australian market, on the other hand, is still experiencing some teething problems in this context.

Another problem arises from the fact that some companies, especially large ones, may be conglomerates with lines of business contradicting selection criteria. In other words, a company may derive a certain percentage of its earnings from a line of business that should be avoided using certain screens. Whereas a company may perform well on one criterion that is of a central concern for a group of investors, it may not perform well on other criteria of concern (The Allen Group, 2000).

The Allen Group (2000) suggests that a maximum limit of 5% of revenue derived from the sale of alcohol and tobacco will allow major retailers to be included in the investable universe. It is further suggested that such practice may be important for smaller markets such as Australia as the universe may otherwise become too limited, and may increase risk and attract a return penalty.

The Best-of-Sector approach has been exposed to some controversy because it includes all sectors of the market, including those that are normally seen as undesirable. Key arguments for this approach include the diversification argument, and also that this approach gives companies in otherwise questionable sectors a chance to improve their performance in regard to SRI criteria, so as to become eligible for inclusion into SRI portfolios (The Allen Group, 2000).

1.2.3 The evolution of socially responsible investing

The history of investment screening can be traced back to the seventeenth century, where the Quakers were the first to apply social screens to their investments in North America. In the interest of making sure their investments were not supporting practices which violated their views on, for instance, slavery, investment screens excluding such activities were used (Kinder and Domini, 1997). In the early 1900s the American Bible Belt was actively screening out "sinful" activities such as alcohol, tobacco and gaming – which indeed are the most common negative screens today (Papmehl, 2001).

Shapiro (1992) suggests four stages of the development of social investing in North America. The first stage, from the 1920s to the early 1970s, comprised the earliest encounters with avoidance-investors. The first South-Africa resolution (based on the apartheid regime) is listed as an important event, as well as the founding of the first socially screened mutual fund, the PAX World Fund in 1971, established by a group of Methodist clergy. Other important developments mentioned include the Dreyfus Third Century Fund, the Council on Economic Priorities, and the South Shore Bank of Chicago (and its community involvement).

The next stage comprised the 1980s where the ethical issues of fund allocation were developing into a movement. The Social Investment Forum was founded, regularly published print media on the issues of social investing were released, and institutions such as Franklin Research & Development, the Investor Responsibility Research Center and the Institute of Community Economics were founded. Retail SRI funds and trusts started to emerge.

The Allen Group (2000) refers to the first socially responsible investors as first generation socially responsible investors. These investors are suggested to have been more willing to forgo financial returns, and more demanding in regard to screening, than are socially responsible investors today.

The third phase of the development of social investment comprised the late 1980s until the beginning of the new millennium, and describes the SRI movement becoming more mainstream. The success of the South-Africa divestiture movement is described as an important driver in this process. Throughout this phase SRI is generally recognised as "a prudent, long-term investment strategy producing comparable returns in a balanced portfolio" (Shapiro, 1992 p. 17). Whilst negative screens are described as the most commonly used, Shapiro suggests there is an increasing interest and demand for positive, proactive investments. SRIs are increasingly being marketed through mainstream brokerage firms, the media coverage of SRIs is becoming more balanced, and environmental investing is said to have replaced divestment as the second international SRI issue.

The establishment of the UN principles of sustainability also represents an important development within this stage. The United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro, Brazil, in 1992 resulted in signed agreements and agendas, all in the name of sustainable global development. The Commission on Sustainable Development (CSD) was created in December 1992 to ensure efficient follow-up of UNCED. The CSD supports and encourages governments and international organisations in their work toward ensuring sustainable development (United Nations Sustainable Development, 1999).

The Allen Group (2000) refers to the socially responsible investors in the later stages of the development of the SRI industry as second generation socially responsible investors, and suggests that these investors are more likely to demand similar returns on their SRIs as on non-SRIs, and less demanding in terms of screening criteria.

The fourth phase comprises the twenty-first century, where Shapiro (1992 p. 17) suggests "SRI is business as usual", and where the development of the SRI industry as reached its maturity in the US.

This sounds much like a success story for SRI products in the US. Australia, on the other hand, is lagging behind in this context, although some important developments have taken place, such as the establishment of the Ethical Investor Association (EIA) and the Ethical Investor magazine. The first screened investment fund available on the wholesale market in Australia was the Warakirri Charitable Australian Equities Trust, established on June 1st 1983. The Challenger Socially Responsible Investment fund and the Australian Ethical Balanced Trust were both offered on the retail market in 1989, the former representing an asset management firm adding an SRI alternative to the existing product-line, and the latter representing an asset management firm specialising in SRI as their primary line of business (Ethical Investor, 2001).

1.2.4 The recent growth in the SRI industry

The growth in the US and the UK

The U.S. and the U.K. SRI industries have both experienced a significant growth in recent years. Anderson (2000) and Birkensleigh, Proske, Kazakoff and Kendrick (2000) report that SRIs in the US grew by 82% from 1997 to 1999 to reach US$2.16 trillion. SRIs account for roughly 13% of the $16.3 trillion under professional management in the US.

The UK has experienced a similar trend with a reported growth of 47.7% from 1998 to 1999. FTSE4Good (2001) reports that there are more than 50 ethical retail funds in the UK alone, and that the value of these funds grew from £199.3 million in Q2 1989 to £3.7 billion in Q4 2000 (an increase of over 1750%). U.K. retail ethical funds under management are projected to be worth £10 billion by 2003.

Other countries having experiences comparable trends include Canada, Germany and France. The Allen Group (2000 p. 14) reports US$3.8 billion invested in 14 ethical funds in Canada, US$2.2 billion in ethical funds in Germany, and 30 existing SRI funds in France[4].

Drivers behind this growth

Traditionally, managers have been concerned primarily with shorter-term profit maximisation and maximisation of shareholders' wealth and consumers have been concerned primarily with the practical product-specific utility of products and services. This has changed dramatically over the last few decades, and both managers and consumers have widened their perspectives on how business practice

[4] These countries seem to be experiencing different trends in terms of screening procedures. Whereas the US and the UK focus most predominantly on screens on tobacco, alcohol and weapon-production, Canada and the other European countries seem to focus mostly on environmental issues (The Allen Group, 2000).

and consumption impacts on the community and the environment. Consequently, this has resulted in consumer, as well as investor, activism[5].

Krumsiek (1997) explains the emergence of the SRI industry with heightened awareness of social issues. Citizens of the developed world now have a much higher awareness of their health, the environment and labour issues than fifty years ago. The health hazards associated with tobacco, the environmental hazards of pesticides and herbicides and the potential benefits of organic food are issues that have only been discovered and discussed in the last few decades, and human rights issues, such as the use of cheap labour in developing countries, have gained public awareness only recently. Consequently, people are now much more aware of, and interested in, how and where the consumption-dollar is distributed.

Krumsiek (1997) also suggests that a segment of the baby-boomer generation, referred to as the "cultural creatives", represents an important driving force behind the development and growth in the SRI industry by combining "a serious concern about their inner lives with a strong penchant for social activism" (1997 p. 26) [6]. Apart from the reasons suggested by Krumsiek, it may also seem possible that an increased standard of living, where individuals on average have more time and money to their disposal, has contributed to consumer and investor activism.

Social awareness is clearly very important in today's society, and this is likely to be reflected in business life (see, for instance, Krumsek, 1997; and Moskowitz, 1997). Krumsek (1997 p. 27) suggests that "today's social concerns quickly become tomorrow's financial concern". Educated consumers are very likely to become educated investors, and raising capital is an important part of business.

[5] Investor activism (or shareholder activism, which is the term EIA uses) is described as "the lobbying by company shareholders, either singly or in groups, for change in the way the company conducts its business" (The Ethical Investor Association Newsletter, 2001 p. 2).

[6] This segment arguably represents one-fourth of American adults, they are "overwhelmingly female, more likely than average to be college graduates, relatively affluent, and on the cutting edge of social change" (Krumsiek, 1997 p. 26). Also, the cultural creatives are arguably increasingly seeking to understand how their consumption decisions affect their lives.

Governments are, of course, important in the development of this industry. Consumer concerns are reflected in political concerns, and the legal frameworks to support and encourage the emerging industries are being developed in many markets.

The U.K. Pensions Act 1995, which requires pension fund trustees to disclose in their Statement of Investment Principles the plan's approach to SRI, provides an example of how such concerns have resulted in government intervention. This is not a requirement to offer ethical investments but rather to disclose whether ethical considerations are taken into account in the plan's investment strategy (Anderson, 2000).

1.2.5 SRI in Australia

In comparison to the substantial growth of SRIs in the US and the UK, Australia's experience has not been as impressive. There is, however, reason to expect growth among SRIs in Australia in the future. Figures on the size of the Australian SRI industry vary greatly with estimates from $250 million (Anderson, 2000) to $300 million, and around $1 billion when church-based investments are included [7] (The Allen Group, 2000).

In Australia, SRI currently only accounts for a very small proportion of the total amount invested in managed funds, both general and superannuation, and only a few SRI funds are available. The Allen Group (2000) reports that ethical funds represent approximately 0.7% of equities in professionally managed funds in Australia, and that there are large potential opportunities for growth in this segment of the market – particularly when bearing in mind that SRIs account for 13% of

[7] The Allen Group (2000) suggests these figures to be underestimates, since they do not include retail investors who buy individual shares using ethical screens. Also, not-for-profit bodies such as churches, foundations and universities may account for around $20 million, and therefore represent a significant proportion of these estimates. Such variation in estimates of the market size may result from differing operating definitions of screened investments.

funds under management in the US. The funds on offer are limited in numbers and diversification across the range of possible asset classes (e.g. bonds and property).

This lagged take-up on SRI has been explained by Australia being relatively slow in taking up financial innovations in general and also by the relatively small market size (The Allen Group, 2000). It is suggested that strong growth will accelerate as the wholesale market increasingly recognises the opportunities in SRI. On the demand side, it is suggested that the Australian market is lagging behind also in awareness of social, ethical and especially environmental issues, and that the a lack of pressure to adopt socially and environmentally responsible production and management practices on firms has held back this development (Birkensleigh et al., 2000).

Recent studies on the attitude to SRI in the Australian managed fund industry, however, suggest the SRI industry will experience strong growth in the near future. A survey conducted by the Investment and Financial Services Association revealed that 45% of investment management firms were planning to add a new SRI offering to their product-line within the following 12 months (Liondis, 2001). Furthermore, an industry survey suggests 13% of superannuation trustees are considering screened investments for their portfolio in the near future, and around 70% of superannuation trustees regard SRIs as a legitimate investment class (Seleeba & Proske, 2000).

Ethical Investment (2001) lists 21 Australian retail SRI trusts on offer as at September 2001, of which 12 are Australian share funds. 11 superannuation SRI funds are listed, two SRI insurance bond funds, and eight wholesale funds.

So far the history of, and growth in, the SRI industries in the U.S., U.K., European and Australian markets have been briefly accounted for. The next chapter will discuss the existing literature on the characteristics of SRIs, in comparison to other investments, as financial assets.

2. A REVIEW OF THE AVAILABLE LITERATURE ON SRIs

2.1 SRI and Finance Theory

2.1.1 SRIs and investor behaviour

The fundamental theory

Mainstream financial theory hinges on the assumption that investors have one source of utility, and that this source is expected terminal wealth, measured by financial return, and one source of disutility, and that this source is risk, measured by the variability of returns. Thus investment decisions are made in a two-dimensional space, where return on investment is maximised and the returns variability is minimised by choosing investments that are mean-variance efficient. Rational individuals should therefore choose a mean-variance efficient investment given the information available, and choices between alternative investments will be made on these two criteria. A risk-averse investor should choose the investment with an equal or greater expected return and an equal or lesser risk, where one of these inequalities must be strict. This investment will thus dominate the other and will be the superior investment. Presented mathematically, investment A dominates investment B if

$$\begin{aligned} & E(r_A) \geq E(r_B) \\ \text{and} \quad & \sigma_A \leq \sigma_B \end{aligned} \tag{1}$$

and at least one inequality is strict, and where $E(r_A)$ represents the expected return on investment A, $E(r_B)$ represents the expected return on investment B, σ_A represents the variability of returns on investment A and σ_B represents the variability of returns on investment B (Bodie, Kane and Marcus, 1999).

The theory of mean-variance efficiency of investments originates from Markowitz (1952; 1976) and his famous work on rational investor behaviour and portfolio selection. This work has since dominated the development of traditional

finance theory as we know it. The strict validity of this theory has, however, been questioned in later years (see, for instance, Markowitz, 1976)[8]. However, financial return and returns variability are still assumed to be the only sources of investors' utility and disutility. One important fact is still left unaccounted for: What about investors who deliberately and knowingly choose the "wrong" investment?

This rationality problem seems to lie not in the assumption of individuals always acting rationally, but rather in how the meaning of rationality has been interpreted and used in financial modelling. Rationality, in the context of economics, refers to individuals' ability to maximise utility and minimise cost, using information at hand. Knowing that some socially responsible investors are consciously choosing investment alternatives that may not be expected to be dominant as per the mean-variance criterion suggests that we may have to accept that return and risk are not always the only sources of utility and disutility.

Behavioural Finance

In observing human behaviour we are forced to accept that man's sources of utility and disutility are many, intricate, and often contradictory to normative theory. For instance, there are gamblers, there are people who knowingly lose out on liquidity and interest on saved funds by placing it in Christmas clubs, and there are, of course, socially responsible investors (Clark-Murphy, 2000). These phenomena suggest there may be other sources of utility and disutility than merely financial return and risk. Behavioural finance theory has been developed aiming to explain such phenomena.

[8] In Markowitz's own (1976) review of the development of investor behaviour he asks the question himself: "Are risk and (expected) return adequate measures of a portfolio's utility to its owner?". In order to calculate the combination of risk and return that maximises the investor's utility the investor's utility function must be known. This is, however, a complicated matter since utility functions are complicated in themselves and will be different amongst investors. The mean-variance model therefore provides a good approximation of how investors may maximise their expected utility, and all individuals share this aim, whether or not they are able to calculate this expected outcome themselves. Markowitz (1976) thereby allows for individuals' constraints in terms of being able to process all the information needed to strictly maximise their utility. He does, however, still assume financial risk and return are the only sources of utility and disutility.

Behavioural finance aims to replace the behaviourally incomplete theory of finance, by focussing on the application of psychological decision processes and economic principles whilst recognising that the existing paradigm can be true within specific boundaries. Behavioural finance does therefore not reject economic concepts and principles that are sound (Olsen, 1998).

How do SRIs fit into finance theory

Socially responsible investors may extract what may be called "extra-financial" utility, or the difference between total utility and utility derived from financial return, from knowing that their investments are supporting activities they regard as beneficial for the environment and society, and/or knowing that their investments do not support activities they regard as damaging to the environment and society. When these additional sources of utility are taken into account, this will change the locus of the optimal utility-disutility efficient investment choice compared to when these extra sources of utility are not included.

Beal and Goyen (1998) investigate environmental investor motivations and argue that the fundamental view must fail if investors do not perceive SRI and donations as close substitutes and are willing to forgo wealth when investing ethically. They suggest that traditional theory will only be a partial explanation of investor behaviour if environmental investors have objectives other than (or in addition to) wealth maximisation while mainstream investors focus on wealth maximisation. Beal and Goyen (1998) suggest that such a finding would have implications for firms' capital budgeting processes, security valuation and portfolio composition, as these activities are founded on the wealth maximisation principle.

A recent survey on Australian shareholder attitudes suggests shareholders are less concerned about profit maximisation and more concerned about environmental and social responsibility than what has traditionally been assumed (Wade, 2001)[9].

[9] This survey, as a part of The Shareholder Project sponsored by a large coalition of philanthropic and business groups, surveyed 1000 Australian shareholders about their attitudes towards corporate behaviour. They found that, in general, the top priority for the company should be: making money for shareholders (29%); being fair to employees (28%); protecting the environment (16%); and contributing to the community well-being (20%). Making money for shareholders was reported to be the least popular priority among the 18-24 age group. 70% of the surveyed shareholders thought

The study of motivations behind socially responsible investing may provide answers to the question of whether, and to what extent, these investors are willing to forgo returns in return for investing responsibly. This, however, is an issue only if SRIs are imperfect substitutes for non-SRIs from a financial asset perspective. We know that these are not perfect substitutes for investors who extract "extra-financial" utility from being able to invest responsibly but we don't seem to have much evidence on whether they are substitutes from a financial asset perspective.

2.1.2 SRIs and CSR – The individual firms' perspective

The driving forces behind the SRI industry are arguably closely related to the driving forces behind Corporate Social Responsibility (CSR). These issues have arisen from investors and consumers taking an active interest in where their dollar spent or invested is going. Consumer activism and investor activism thereby link SRI and CSR.

Post, Frederick, Lawrence and Weber (1996 p. 677) define CSR as "The idea that businesses are accountable for the effects of their actions and should seek socially beneficial results".

It is suggested that we should distinguish between two ways in which companies may be socially responsible, namely social responsibility in business practice and social responsibility in terms of goods and services provided (Tippet, 2001). A company that employs superior business practices based on social and environmental criteria, and thus qualifies for the CSR title, may still produce products and services that do not conform with investor values, and vice versa. Hence, the CSR title should not automatically imply inclusion into SRI portfolios.

---

companies usually act in their own interest or the interests of big shareholders. 80% of respondents said they would be prepared to accept a lower dividend or share price in return for being able to invest ethically, although only 20 percent of these reported having made ethical investments (Wade, 2001).

Theories on whether SRIs differ from other investments as financial assets

Whether SRIs (assuming that companies adopting CSR are included into this category) carry different risks and returns to non-SRIs has been widely discussed from a theoretical viewpoint. Anderson (2000) discusses how SRIs may differ from other investments in terms of investment risk. Investment risk, in regards to individual SRIs, would be related to the specific asset classes under which these investments could be classified. For instance, if SRIs can be classified as growth-stocks more so than value-stocks, as is frequently suggested (see, for instance, Kurtz, 1997), they should then have risks comparable to growth-stocks in general. Anderson also suggests that socially responsible firms are less likely to have their share prices affected by environmental remediation (or clean up), litigation and compensation payments, and therefore may be more viable in the long term.

So are SRIs undervalued investments? If the Efficient Market Hypothesis holds in its semi-strong form, then potential gains or losses implied by any publicly available information on a firm's business activities, including the impact on social wellbeing and the environment from its operations, should at all times be reflected in the share price (Bodie et al., 1999) [10].

Gottsman and Kessler (1998) present two opposing theories of how a firm's market performance is affected by its environmental performance. They suggest a positive proposition, or the green dividend hypothesis, which holds that "good environmental performance is coincident with factors that produce good market performance (for example, good management generally), and that this fact is not adequately recognised by capital markets. The stock of environmentally superior firms is underpriced" (Gottsman and Kessler, 1998 p. 15). This proposition would therefore imply that such stocks are value rather than growth stocks.

The negative proposition, or the green penalty hypothesis, holds that "superior environmental performance is a drag on stock market performance because

[10] The weak-form EMH holds that "stock prices already reflect all information contained in the history of past prices", the semi-strong form EMH holds that "stock prices already reflect all publicly available information" and the strong-form EMH holds that "stock prices reflect all relevant information including insider information" (Bodie et al., 1999 p. 933).

investments in pollution control could be more profitably allocated elsewhere" (Gottsman and Kessler, 1998 p. 15).

How does investment screening affect firms' cost of capital?

If investors prefer some investments to others based on criteria other than firm-specific fundamental financial risk and return, then this should have some effect on firms' cost of capital. Merton (1987) presents a model where the cost of capital for a firm depends on the number of investors willing to hold shares in that firm. The model is specified

$$\lambda_k = \frac{(1-q_k)}{q_k} x_k \delta \sigma_k^2 \qquad (2)$$

where λ_k is the cost of capital for firm k, q_k is the fraction of investors willing to hold shares in firm k, x_k is the weight of the firm in the market portfolio, δ is the risk aversion parameter for each investor in the model, and σ_k is the variance of the firm's return due to firm-specific rather than market factors. This model shows that when the fraction of investors willing to hold shares in a firm decreases this has an increasing effect on the cost of capital.

Angel and Rivoli (1997) discuss the effect on the firm of ethical screens using this model and discuss the impact of a large change in the proportion of investors willing to hold shares in a firm. They refer to the basic dividend growth model for a firm, where the firm's share price P_0 is determined by the expected dividend D_1, the required rate of return r, and the dividend's constant perpetual growth rate g.

$$P_0 = \frac{D_1}{(r-g)} \qquad (3)$$

When the cost of equity increases significantly, this affects the required rate of return positively (i.e. the required rate of return will increase) ceteris paribus, and thus the price of the share will decrease.

Angel and Rivoli (1997) argue that unless a substantial fraction of the capital market boycotts a firm, the increase in the cost of capital is likely to be small. They also suggest that whilst a small change in the cost of capital may be negligible at a particular point in time, the cumulative costs may become significant. Their findings show that the effect of changes in investors' willingness to own stocks in a firm on the firm's cost of capital is not uniform across firms. They find that for large, fast-growing, riskier firms (where the cost of capital is likely to already be relatively high) avoided by a large proportion of investors, the effects may be significant, whereas such effects may be negligible for other firms. They conclude therefore that investor behaviour will only affect certain firms, and that investors therefore should be selective when wishing to influence firms through screening practices.

Feldman, Soyka and Ameer (1997) investigate whether superior environmental performance results in a higher stock price (the results of their empirical research is discussed in section 2.2.1) and present a visual model displaying how environmental management and performance may affect firm value. The model is reproduced below.

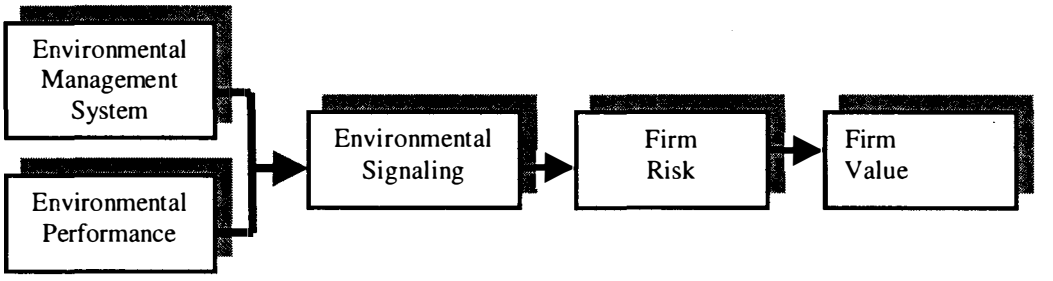

Figure 1: The ways in which environmental responsibility may impact on firm value

(Source: Feldman, Soyka and Ameer, 1997 p. 89)

2.1.3 SRI funds and portfolio theory

Portfolio theory distinguishes between two main types of risk, namely market risk and unique risk. Market risk is also referred to as nondiversifiable or systematic risk, and represents risk that cannot be affected by portfolio diversification. Unique risk, also referred to as diversifiable, firm-specific and non-systematic risk, represents risk that can be affected by portfolio diversification (Bodie, Kane and Marcus, 1999). The market portfolio, which includes all investable assets (or every asset in the investable universe), thus represents a perfectly diversified portfolio where all diversifiable risk is minimised. In reality, the perfectly diversified portfolio is not attainable (because *all* investable assets must be included), but a portfolio manager can minimise the diversifiable risk of a portfolio by maximising its diversification given his or her constraints.

Portfolio theory asserts that fund managers should consider minimising portfolio risk by diversifying the portfolio holdings. If SRI portfolios are less adequately diversified than non-SRI portfolios this would imply that SRI portfolios incur a higher diversifiable risk. Adequate portfolio diversification does, however, not only refer to the number of securities included in the portfolio, but also the diversification of these securities across industry sectors or asset classes where returns tend to be highly correlated (Markowitz, 1976). Fund managers should therefore minimise diversifiable risk by taking into account the return covariances of the included securities. If SRI portfolios are more heavily weighted in industry sectors or asset classes with highly correlated returns than are non-SRI portfolios, implying higher covariance of the security returns, then the SRI portfolio would incur a higher diversifiable risk.

So do SRI portfolios minimise diversifiable risk? The answer would arguably depend on the investment strategies employed by the individual SRI fund manager. Unless all SRIs have highly correlated returns, a fund manager should be able to minimise risk by including SRIs with lowly correlated returns. Even if SRIs

consistently have higher unique risk than other investments, this is not an issue unless SRI returns seem to be highly correlated with each other as well.

SRI funds that use positive and/or negative screens may be exposed to more diversifiable risk if they are over- or under-exposed to types of investments that tend to have highly correlated returns. If, for instance, the tobacco-industry tends to have returns that are negatively correlated with other industries a negative tobacco screen will then exclude returns that would hedge for the variance in returns in the other industries. This also applies to over- or under-exposures to asset classes such as growth, value, small and large stocks.

Gottsman and Kessler (1998) discuss these issues, with specific focus on environmental screens, and argue that screens do result in over and under-exposures to sectors and asset classes. They suggest that "An environmental screen, like any other screen, will affect sector balance, total market capitalisation, and other factors that can influence returns. But these effects can be corrected in the design of the screened set without affecting its environmental performance profile" (Gottsman and Kessler, 1998 p. 23).

Another issue in this context stems from Tippet's (2001) suggestion regarding the two different issues about which ethical investors are concerned, as discussed in part 2.1.2. Tippet (2001) argues that funds basing their selection criteria on the products and services produced typically in effect exclude whole industries, which may represent important sources of return, and will therefore incur a financial cost to the fund members. This is in accordance with the "lack-of-diversification" criticism so many are using when discussing SRI fund management. But what if companies are evaluated on their social and environmental responsibility in business practices? If the firms adopting such practices appear to be spread fairly evenly across industries, then this is a type of selection criteria that will arguably *not* incur such a diversification cost on fund returns. This seems to be the main argument for adopting the Best-of-Sector selection approach.

Teper (1992) propose five primary reasons why socially responsible portfolios may have lower risk-adjusted returns than unrestricted portfolios, capturing the main sources of criticism against SRI:

1. Lower security returns – if better performers are on a restricted list and poorer performers are either overweighted or subsequently added to the portfolio.

2. Higher security risk – if large companies are replaced by smaller more volatile companies.

3. Lower portfolio diversification – if the criteria force the portfolio to be underweighted in major industries or sectors.

4. Divestment transaction cost – the one-time cost of eliminating nonqualifying stocks and adding or reweighting others.

5. Opportunity cost of eliminating an asset class – for example, not investing in international equities because it may be too difficult to monitor social responsibility.

This broadly summarises the issues discussed in this section of the literature review. The next section of the literature review will review empirical research aimed at investigating whether empirical work support these theories.

2.2 Empirical studies: The performance of SRIs

2.2.1 Empirical studies on the financial characteristics and relative performance of socially responsible firms

Feldman, Soyka and Ameer (1997) claim that evidence suggests the senior managers of most American firms subscribe to what Gottsman and Kessler (1998) refer to as the green penalty hypothesis, rather than the green dividend hypothesis [11].

Feldman et al. (1997) investigate which of these hypotheses is best supported by empirical evidence. They survey what they deem to be a large and representative sample of the most prominent listed U.S. companies over the time period from 1980 to 1994, and find that adopting environmental responsibility has a favourable and significant impact on investors' perceived riskiness of the firm, the cost of capital as well as the firm's market value. Indeed, they suggest that improved environmental management and performance can increase market value by as much as 5%. These 5% can represent substantial amounts. They do emphasise that this estimate is illustrative rather than definitive, and that the impact of improved environmental performance and management will depend on what activities are actually performed and on the amount, distribution and timing of such investment. Naturally, investors' level of education and interest in regards to firms' environmental performance will be an important factor, as market value is determined by investors' perceptions of the future performance of the firm. Also, the comprehensiveness and quality of the information infrastructure for communicating such information to investors will contribute to this effect.

When performing a similar study over the time period from 1992 to 1997 Gottsman and Kessler (1998) find that both returns and variability of returns seem to be statistically unrelated to environmental and social performance[12]. This means that portfolios excluding companies with poor environmental and social performance will

[11] These hypotheses are discussed under "Theories on whether SRIs differ from other investments as financial assets" in part 2.1.2.

[12] The analysis is performed on construced portfolios comparing the best 25%, 50% and 75% of companies in terms of social and environmental performance to the worst 75%, 50% and 25% of companies, respectively.

not perform worse than portfolios constructed from the unrestricted universe. The conflicting results may have arisen from the different time periods over which the studies were performed.

McGuire, Sundgren and Schneeweis (1988) investigate whether socially responsible firms tend to have different fundamental characteristics. When comparing socially responsible firms to other firms they found that socially responsible firms have significantly lower debt-to-equity ratios, significantly higher return-on-assets ratios, and significantly lower standard deviations of total return[13].

Waddock and Graves (2000) perform a similar study using companies included in the Domini 400 Social Index and the S&P 500 Index. They find the only statistically significant difference (at 95% confidence) in sales, where the socially responsible companies in the sample gave lower average total sales than the S&P 500 companies. The two groups were found to be statistically indistinguishable for all the other measures.

If Feldman et al. (1997) are correct in their assumptions, and having accounted for the factors affecting the impact on the share price of environmental improvement in production and management, how does this seem to correspond to the Australian market? As discussed in section 1.2.5 the Australian market seems to be lagging behind the U.S. and European markets in terms of the level of awareness of environmental issues, as well as other SRI issues. In terms of the comprehensiveness and quality of the information infrastructure for communicating information on firms' environmental and social performance, this infrastructure is not yet as well developed in Australia as in the US and Europe (The Allen Group, 2000). It seems therefore plausible to assume that if, as the Feldmal et al. (1997) study suggests, environmental improvement has a positive effect on the share price, then this effect is likely to be of a somewhat lesser magnitude for Australian firms than for U.S. and European firms.

[13] Note if socially responsible companies have consistently different style-characteristics than other firms, it is possible that such differences could partly explain these findings.

The Allen Group (2000) suggest that the influence of socially responsible investing on the performance of companies is unclear in this early stage of the evolution of the industry. They also emphasise that "the same community expectations that are driving socially responsible investing are driving companies to reconsider their impact on the environment and the community" (The Allen Group, 2000 p. 16).

2.2.2 Studies on the relative performance of typically excluded or included stocks

Besides looking at the effect on share prices of environmental and social improvement, empirical research has also been conducted investigating the relative performance of typically included and excluded industry sectors. Because the tobacco screen is the most widely used negative screen in many markets the tobacco industry seems the natural starting point for this type of research.

Kahn, Lekander and Leimkuhler (1997) investigate the relative performance of large capitalisation U.S. companies with tobacco operations in the time period from 1987 to 1996. They compare the S&P500 portfolio with an S&P500 ex-tobacco portfolio and find that tobacco stocks have performed impressively during this time-frame. They do, however, argue that these stocks are highly uncertain, and that their returns may be expected to fall due to the divestiture by large scale investors.

Kahn et al. (1997) suggest that the increased diversifiable risk that results from excluding tobacco stocks from a portfolio may be compensated for by an equal portfolio weighting in another industry with which the correlation of returns is high. The three highest correlations to the tobacco industry, in the US, are found in the agriculture and food industry, the home products industry and the leisure industry (correlation coefficients for these industries range from 0.517 to 0.582).

To investigate how this discussion relates to the Australian market, the total reinvested returns from the Australian alcohol and tobacco industry, which should represent a typically excluded industry in an SRI portfolio, is compared to the ASX All Ordinaries Index in figure 2 [14].

The diagram shows that the Australian alcohol and tobacco industry under-performed compared to the All Ordinaries for most of the period (June 1992 to August 2001) with a slight relative over-performance during the 1999 period and towards the end of the period. This seems to suggest that Australian SRI funds excluding alcohol and tobacco stocks may have gained compared to funds including such stocks depending on the time period.

A correlation matrix for the Australian ASX sub-indices is provided in part 7.3.3 of the appendices. The banking sector represent the industry most closely related to the alcohol and tobacco industry in Australia, from a financial assets perspective, with a correlation of just over 52%. If Australian SRI fund managers were to employ the strategy suggested by Kahn et al. (1997), whereby the omitted industry weighting is compensated for by an equal weighting in an industry with closely correlated returns, the banking industry would arguably be the relevant industry (provided, of course, Australian banks are accepted as socially responsible investments).

Teper (1992) broadens the "sin-stock" debate further and investigates returns on U.S. "sin-stocks" by comparing these to the S&P 500 index during the time period from 1979 to 1989, in order to provide an indication of how exclusion of such stocks may affect a portfolio. Three "sin-industries" are selected, namely alcohol, gambling and tobacco stocks, major defense contractor stocks, and birth control manufacturer stocks [15]. He finds that the annualised differences in returns for these industries, compared to returns of the S&P 500 index, are +10.8% for alcohol, manufacturer

[14] Total return indices for this industry and for the whole market (including the tobacco and alcohol industry) have been constructed based on the ASX Alcohol & Tobacco Total Return Index and the ASX All Ordinaries Total Return Index from start, June 1992, until August 2001.

[15] Birth control manufacturer stocks are typically excluded for religious reasons. These screens would be more predominantly used in church trusts and other religion-related funds than ordinary retail SRI funds. This is at least the case in Australia.

stocks. The high over-performance of tobacco, gaming and alcohol stocks corresponds well with the findings of Kahn et al. (1997) discussed earlier in this section. Australian tobacco and alcohol stocks, as argued above, does not seem to share this experience[16].

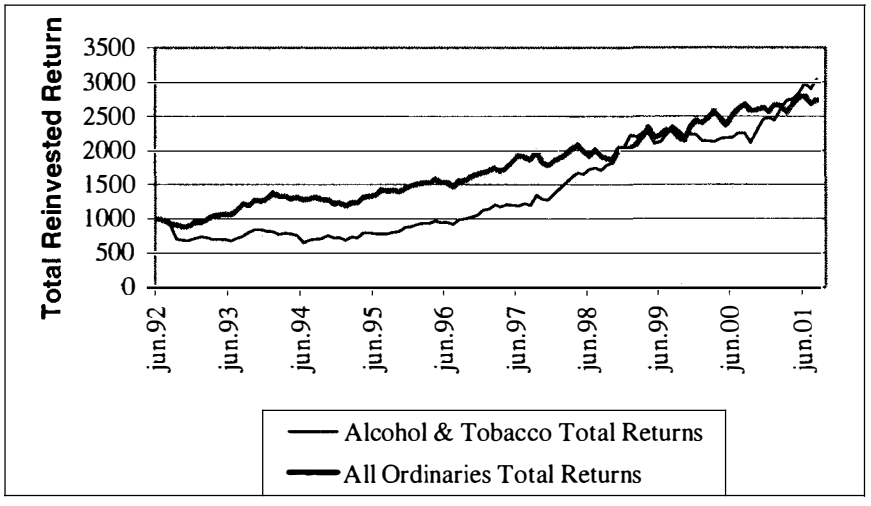

Figure 2 – The relative performance of the Australian alcohol and tobacco industry

Source: Total return series provided by Datastream.

Teper (1992) constructs restricted and unrestricted portfolios, and compares the returns from these over the time period from 1984 to 1990. He finds that social restrictions consistently imply a cost of around 1.1% annually, risk adjusted. He also investigates whether active management can compensate for the potential losses in

[16] The Australian gambling stocks do not represent a significant proportion of the market, so there is little reason to suspect these stock would change what is already assumed about the performance alcohol, tobacco and gaming stocks category. That said, the ASX tobacco and alcohol index only includes 10 stocks. Australian gambling stocks are listed under the ASX tourism index, where Burswood Casino, Casino Australia and TAB are listed.

excluding profitable "sin-stocks", and finds that this does not seem to be the case. He compares passively managed funds to actively managed funds and finds that active management does not seem to have eliminated this cost. He concludes that while an annual cost of 1% may seem fairly small this cost accumulates quickly, and that socially responsible investors must be aware of this. He suggest that this cost may decrease in the future as more companies become socially responsible and active managers attempt to compensate for this cost, but that the industry must accept that SRI funds have incurred a cost to their investors thus far.

The findings of Gottsman and Kessler (1998) contradict these findings. They construct portfolios with environmental and social screens and compare their returns with unscreened portfolios over the time period from 1992 to 1997, and find that excluding companies from investment portfolios using these screens has no significant effect on returns or on risk adjusted returns, in either a positive or a negative direction. The differing results may stem from differing time periods over which the studies were conducted.

Guerard (1997) produces yet another result in his study conducted over the time period from 1992 to 1997. He also investigates the impact of different commonly used screens on portfolio returns and finds that the use of environmental; alcohol, tobacco and gaming; military; and nuclear screens produce higher returns than those from unscreened portfolios, and that the only screen imposing a cost to the returns is the military screen. Comparing this to Teper (1992) and Gottman and Kessler's (1998) results, we may be forced to conclude that the effect of different screens on portfolio performance is unequivocal and may be sensitive to the research methodologies and time frame of the studies.

2.2.3 Empirical studies on SRI funds

So far, we have discussed how corporate social responsibility relates to SRIs, how exclusion of certain sectors (in particular the tobacco sector) may affect the SRI portfolio, and how we should expect, from theoretical viewpoints, SRIs to behave in the market place. Artificially constructed screened funds have also been evaluated in the search for better insight of what socially responsible investors may expect from

their fund managers. But how do they really behave? Empirical studies on SRIs have been limited but increasing, both overseas and in Australia.

Guerard (1997) finds that returns of U.S. socially screened funds do not differ significantly to the unscreened universe in the 1987-1996 period. Guerard also provides some research on the investment style and finds that larger, more value-oriented stocks typically are excluded from screened funds. The latter supports the commonly stated assumption of SRIs being growth rather than value stocks (see, for instance, Kurtz, 1997). John Ilkiw, global consulting practices director at Frank Russel Co., Tacoma, is reported to have said, in an interview with *Pensions & Investments*, that screening out "sin-stocks" has no significant impact on investment performance compared to non-screened portfolios (Payne, 2001).

Wollenberg (2001) reports that of 48 SRI funds with at least a 3-year performance history, seven (15%) earned five stars and 12 earned four stars from Morningstar, which rates the mutual fund industry by performance. According to Wollenberg, only 10% of all mutual funds get the five-star rating, suggesting SRI funds may be better performers on average. This evidence is, however, rather weak.

Evidence from Australian SRI funds

Cummings (2000) investigates the performance of a sample of Australian screened funds by use of a three-factor Jensen measure where an industry factor, a smaller company factor and a market factor is included. The industry factor, determined by the type of unit trust, is proxied by the funds' respective Industrial Indices, which are grouped along five categories. These categories are:

1. Managed Funds Growth,
2. Australian Equities Growth,
3. Managed Bonds Growth,
4. Managed Superannuation Growth,
5. Managed Deferred Annuities – Growth.

An index of all companies listed on the Australian Stock Exchange (ASX), excluding the top 100 companies by market capitalisation is used as a proxy for the smaller companies factor, and the ASX All Ordinaries Accumulation Index is used as a proxy for the market factor.

The *R*-squares (measuring what proportion of the variations in fund returns is explained by the model) are relatively low, ranging from 0.138 to 0.743, and the resulting Jensen alphas are insignificantly different from zero (both at a 5% and a 10% level).

In order to test for the differences in ethical trust returns compared to the respective Industrial Indices, the smaller companies index and the market index, a single-factor Jensen measure, the Sharpe measure and the Treynor measure is used. These measures are more closely explained in section 2.3. The single-factor Jensen measure is calculated using the All Ordinaries Index as a proxy for the market factor.

None of these performance measures suggest any over- or under-performance when comparing returns to their Industry Indices. Some, however, seem to have under-performed when compared to the small company index, but Cummings (2000) emphasises that this comparison is made over a relatively short time-frame, which may affect the reliability of such a result. He also mentions the possible bias that may have been caused by an exceptional performance and growth in smaller companies on the Australian share market. Also when comparing the ethical trusts to the All Ordinaries Index, Cummings finds that they tend to under-perform, but these figures are not significantly different from zero.

Cummings's (2000) results therefore provide little substantial evidence to support the hypothesis that ethical trusts perform differently to the respective industry indices, the small companies index, or the market index.

Tippet (2001) selects three Australian Ethical Funds, namely the Tower Life fund, the Tyndall fund and the Australian Ethical fund, and compares these to the ASX All Ordinaries Accumulation Index. He finds that one of these, the Australian Ethical fund, which also is recognised as the "purest" in terms of selection criteria,

gave fairly consistently less than half the returns of the market index. The two others did not seem to significantly over or under-perform on average [17]. None of these returns are risk-adjusted, however, and the chosen benchmark may not be as representative for evaluating these funds as various comparable managed fund indices might have been.

Tippet (2001) further investigates the performance of the ethical funds compared to the performance of the five companies with the highest weightings in the respective portfolios, and finds that the fund returns were lower than the combined returns of these top five investments. He claims this to support the assumption that screening incurs higher transaction and management expenses.

Tippet (2001) uses a composite portfolio of the three funds, using the fund betas, and calculates the expected return in this portfolio using a one-factor Capital Asset Pricing Model where the All Ordinaries Accumulation Index represents the market factor. The calculated expected return is 10.30% per annum, which is more than the actual fund performance. Tippet (2001) therefore concludes that this portfolio has incurred a financial cost of 1.59% per annum. He also calculates the Treynor measure and the Jensen alpha and concludes from the latter that only the Tyndall fund did not experience negative abnormal performance.

These two studies represent the beginning of a, hopefully, continuing evolution of empirical studies of Australian SRI funds. The studies on Australian and U.S. SRI funds present a wide range of methodologies for evaluating such funds and also a wide range of benchmarks used for evaluating their performance. The results are also very varied.

The present study will hopefully represent a step towards better understanding of the SRI fund industry, primarily by investigating the style of Australian SRI funds - a type of analysis that has been lacking to date. This seems

[17] The Tyndall fund seems to have annual returns curiously uncorrelated with the market returns. This sort of tracking-error may indicate a different investment style, and this fund would be interesting to analyse in the style analysis undertaken in this study. The fund is not included in my study because it is not listed on the Ethical Investor's list of available ethical funds, which seem to indicate that this fund is no longer available.

curious, since so much of the discussion and criticism of SRI funds is based on how they are assumed to differ from unscreened funds with regard to investment style. The present study seeks empirical evidence for these commonly stated assumptions using a sample of Australian SRI funds.

The next chapter will review the literature on the fund performance measures and style analysis as this is relevant to the methodologies of the present study.

3. A REVIEW OF THE LITERATURE ON FUND PERFORMANCE MEASURES AND STYLE ANALYSIS

3.1 Portfolio performance measures

There are several approaches to evaluating portfolio performance. On a very basic level, a portfolio's raw returns may be compared to that of a chosen benchmark. The next level of methodology sophistication may imply controlling for risk by calculating excess returns of the portfolio and the benchmark. More sophisticated performance measures may control for different types of risk and market performance.

Bodie, Kane and Marcus (1999) present four portfolio performance measures used in the industry. These include Sharpe's measure, Treynor's measure, Jensen's measure and the appraisal ratio. As we have seen in the first part of the literature review, Sharpe, Treynor and Jensen's measures have been used by, for instance, Cummings (2000) and Tippet (2001) in evaluating portfolio performance.

Sharpe's measure is a reward-to-variability ratio and divides average portfolio excess return over the sample period by the standard deviation of returns over that period. It is given by $(r_p - r_f)/\sigma_p$. Treynor's measure is similar to the Sharpe measure, but uses systematic risk instead of total risk. It is given by $(r_p - r_f)/\beta_p$. In these formulae r_p represents the portfolio's average return, r_f represents the average risk-free rate, σ_p represents the portfolio standard deviation and β_p represents the portfolio's beta relative to the market benchmark (Bodie et al., 1999).

Jensen's measure is the average return on the portfolio, exceeding the return predicted by the Capital Asset Pricing Model (CAPM), given the portfolio's beta and the average market return. This measure is commonly referred to as the portfolio

alpha, and is given by $\alpha_p = r_p - [\, r_f + \beta_p(r_M - r_f)]$ [18], where α_p represents the portfolio alpha and r_M represents the average market return. The appraisal ratio divides the portfolio alpha by the non-systematic risk of the portfolio and measures abnormal return per unit of risk that in principle could be diversified away from holding a market index portfolio. It is given by $\alpha_p / \sigma(e_p)$, where $\sigma(e_p)$ represents the non-systematic risk (Bodie et al., 1999).

The appropriate performance measure for a portfolio depends on the role of this portfolio. Bodie et al. (1999) assert that Sharpe's measure is appropriate when the portfolio represents the entire investment fund, as opposed to the appraisal ratio, which is appropriate when the portfolio represents an active portfolio to be optimally mixed with a passive portfolio. The Jensen and Treynor's measures are, however, appropriate when the portfolio represents one sub-portfolio of many (Bodie et al., 1999).

3.1.1 The Jensen measure

The Jensen measure may be expanded to control for more factors than just the market factor. For instance, Cummings (2000) expands the Jensen measure to include three factors, namely a relevant industry factor, determined by the type of fund to be evaluated, a small companies factor and a market factor (these are discussed in more detail in part 2.2.3). This three-factor model is given

$$R_{jt} = \alpha_j + \beta_{j1} R_{Industry,t} + \beta_{j2} R_{SmallCo,t} + \beta_{j3} R_{Market,t} \qquad (4)$$

where R_{jt} represents excess return on portfolio j, α_j represents the portfolio alpha, $R_{Industry,t}$ represents excess return from the industry index, $R_{SmallCo,t}$ represents excess return from small companies and $R_{Market,t}$ represents excess return on the market, at

[18] Throughout this paper the model used for calculating the Jensen measure is expressed with the risk-adjusted portfolio return, $r_p - r_f$, being the dependant variable, on the left hand side, and with all independent variables on the right hand side of the equality sign.

period t.

Drew and Stanford (2001) use a four-factor model, and include a market factor, a size factor, a style factor and a fixed interest factor in their model, so that these factors can be controlled for when calculating the alpha. That is, the difference in performance between small and large stocks, the difference in performance between growth and value stocks, and the risk-premium on fixed-interest securities are included as explanatory variables. The model is given

$$R_{it} - R_{ft} = \alpha_i + \beta_{mi}(R_{mt}-R_{ft}) + \beta_{si}(R_{st}-R_{lt}) + \beta_{gi}(R_{gt}-R_{vt}) + \beta_{di}(R_{dt}-R_{ft}) + \varepsilon_i \quad (5)$$

where R_{it} represents the return on portfolio i, R_{ft} the risk-free rate of return, R_{mt} the market return, R_{st} the return on small stocks, R_{lt} the return on large stocks, R_{gt} the return on growth stocks, R_{vt} the return on value stocks and R_{dt} the return on debt at period t. α_i represents the portfolio alpha and ε_i a random error term.

The Jensen alpha thus represents a portfolio's risk-adjusted return when the returns of the included factors are controlled for.

3.1.2 Limitations of the Jensen-alpha performance measure

Tracking error, which is defined as the difference between the returns of the fund and the benchmark-returns (Frino and Gallagher, 1996), is typically an issue when evaluating fund performance. Because funds typically are evaluated using a passive index, such as the ASX All Ordinaries Accumulation Index in Australia, tracking error results from these benchmarks not taking account of costs that, ultimately, are incurred to fund members through management fees and other managed fund-related costs. Frino and Gallagher (1996) list possible sources of tracking error, including transaction costs, index composition changes, corporate activity, cash flows, index volatility, and reinvestment of dividends, and find in their

study that cash flows, market bid-ask spreads and index volatility are significant determinants of tracking error for Australian funds [19].

It is important to use an appropriate benchmark with which the fund performance is compared, regardless of what performance measure is used. The performance measure is thus calculated for the fund in question and for the benchmark, and these measures are compared in order to evaluate the fund's performance relative to the benchmark.

The present study uses a four-factor alpha model similar to that presented by Drew and Stanford (2001) when evaluating relative performance of Australian SRI funds.

3.2 Style analysis

3.2.1 About style analysis

Investment style typically refers to investment attributes that are distinguishable in terms of fundamental financial measures. Two commonly used style-measures include the market capitalisation (or size) of a firm and the firm's book-to-market ratio (indicating growth or value attributes). Asset classes thus typically distinguish between for example small, medium and large capitalisation stocks, growth and value stocks, domestic and international securities, cash equivalents and bonds. The terminology is commonly used in the context of managed funds in order to classify funds by their investment style, that is – how the fund holdings are spread across asset classes.

[19] Roll's (1992) critique of the practice of fund managers trying to produce a more efficient managed portfolio by minimising the volatility of tracking error is not as relevant in this context as in other situations. Roll's argument holds that the market portfolio is not mean-variance efficient, that other attainable portfolios exist that are more mean-variance efficient and that fund managers therefore do not optimise their portfolios by matching the benchmark.

Lucas and Riepe (1996 p. 4) define returns-based style analysis as "a statistical technique that identifies what combinations of long positions in passive indices would have most closely replicated the actual performance of a fund over a specified time period". Returns based style analysis is largely attributed to Sharpe (1992).

Sharpe (1992), Lucas and Riepe (1996), Buetow, Johnson and Runkle (2000) and Groenewoller, McLeod and Rose (2001) use returns based style analysis to investigate fund styles, and include factors such as returns on small, medium and large capitalisation stocks, growth and value stocks, bonds and international equity in their models. Style analysis can, however, be used to investigate portfolio weightings across other categories, provided the factors used are mutually exclusive and exhaustive and that the factors have different returns, i.e. the correlations between them must not be too high [20]. Style can therefore also be used as a term where stocks are grouped by industry. Buetow et al. (2001) include some industry sectors in their list of possible factors to be included in style analysis.

One objective of applying style analysis to funds is the possibility of being able to predict returns based on what we know about the weightings of asset classes within that fund (Lucas and Riepe, 1996). The analyst's ability to do this is, of course, dependent on the stability of the fund's asset allocation. A fund manager who over time alters the fund holdings only within asset classes, holding the weightings constant, should theoretically incur less returns-variability than a fund manager who changes the weightings during the time period in question.

It follows from this that fund managers should aim to keep asset allocations fairly constant over time. Provided that a given asset allocation implies a calculable expected return (and possibly risk) it must therefore also be possible to design a style (that is, asset allocation) to match a desired combination of asset-class related risk (or risk by exposure) and expected return.

[20] According to Sharpe (1992) these requirements are desirable, but not strictly necessary.

From the investor's perspective, he or she may seek a certain exposure to a certain asset class. If, for instance, an investor wants 25% exposure to international equity, then he or she could simply chose the fund whose disclosed information on asset allocation matches this proportion. Asset allocation is, however, not easy to obtain at frequent intervals, and may not always reflect the true average fund asset allocation over time or how the fund is exposed to movements in different markets. The investor's objective is, ultimately, to have a portfolio return that is "25% dependent on" movements in the international equity market – regardless of what the actual asset allocation is. An investor who wishes to allocate 25% of his or her portfolio to international equities can therefore select a fund where the sensitivity to movements in this asset class matches 25%, indicating that the fund, at least, behaves as if it has this weighting in international equity (Lucas and Riepe, 1996).

Lucas and Riepe (1996) argue that that a fund's asset allocation may not be perfectly reflected in its returns. For example, because many domestic companies trade with foreign companies they may be highly exposed to movements in the international economy, their returns would be affected by such movements. Thus style analysis reveal a fund's *real* exposure is to style-factors, for which disclosed asset allocations may be an inadequate measure. Lucas and Riepe also suggest that using style analysis significantly improves the R-squared values when explaining returns on funds (compared to using benchmarks).

Another objective of using style analysis arises from the availability and quality of disclosed fund asset allocation. Some managers do not readily provide such information, and those who do may not necessarily disclose the funds' long-run average pattern of asset allocation, and may even manipulate holdings for the time where the asset allocation is disclosed so as to match set targets. Style analysis provides a solution to such problems by revealing the funds' real average exposures to asset classes, using readily available passive indices and fund returns.

Thus, style analysis will not necessarily reflect the true asset allocation of a fund. Fund managers may or may not give accurate information on their funds' asset allocation, and asset allocation may also vary over time, but a style analysis such as

that presented here gives an indication of how the changes in return have matched return on the different factor proxies over a period of time, on average.

Model specification

The basic model used for style analysis, as presented by Sharpe (1992), is given by

$$R_i = [b_{i1}F_1 + b_{i2}F_2 + \ldots + b_{in}F_n] + e_i \qquad (6)$$

where R_i represents the return on fund i, F_1 represents the value of factor 1, F_2 represents the value of factor 2, F_n represents the value of the n^{th} factor, and e_i represents the "non-factor" component of the return on fund i. The values of b_{i1}, b_{i2}, and b_{in} represents the sensitivities of R_i to factors F_1, F_2 and F_n. The components inside the brackets are those indicating the style of the fund, whereas the residual will reflect the proportion of fund return caused by selection. The residuals are assumed to have a mean of zero and be uncorrelated with the independent variables.

By regressing the fund return series on a chosen set of factors, using appropriate proxies, the sensitivities of the fund returns to each of the factors are generated. These computed sensitivities, or betas, will indicate what proportion of the variability in fund returns matches the returns from the different factor proxies, thus indicating how the fund is exposed to these factors [21]. The computed R-squared values for the model indicate the "goodness of fit" of the model, that is – the extent to which the explanatory variables explain the variation in fund returns.

The number of factors included in the model will affect the "quality" of the computed betas. An under-specified model will not be very useful as important sources of returns may be left out, and a model with too many factors is very likely to suffer from multicollinearity, in which case the individual beta values are likely to be small and insignificant and unreliable as indicators of sensitivity of returns to the specific factors. Multicollinearity is typically indicated by high R-squared values and simultaneously small and insignificant betas when applying Ordinary Least Squares

[21] Note that such analysis will merely look at how the fund is behaving in the market, and the result will inform that the firm is behaving *as if* the fund is exposed to the factors as implied by the betas.

(OLS) (Pindyck and Rubinfeld, 1998). Highly correlated returns of the factors included in the model can also indicate multicollinearity. This problem is difficult to rectify, but calculating bilateral correlations between all factors included in a model may provide an indication of where in the model multicollinearity is most likely to be present. Sharpe (1992) asserts that even if the R-squared values for the model remain unchanged, a model with fewer factors is more likely to represent "continuing fundamental relationships with predictive content" (Sharpe, 1992 p. 8).

The models used in asset class style analysis differ in terms of included factors, but they usually include capitalisation, value/growth, fixed interest, cash, and international assets as a minimum. As already discussed, model specification affects the reliability of estimated parameters and thus the usefulness of the model. As many sources of returns-variability as possible should be included to account for exposures. However, the nature of these factors (representing tradable assets) typically implies a high probability of linear relationships existing amongst them (i.e. multicollinearity), which again implies unreliable estimates.

Others employing style analysis have specified their models to varying sizes and degrees of specificity. Groenewoller et al. (2001) use a comparatively small nine-factor model when analysing New Zealand investment funds. Lucas and Riepe (1996) also use a nine-factor model, but use different factors. Sharpe (1992) includes 12 factors in his example. Buetow et al. (2001) suggest an extensive list of 27 possible factors, but keep the number of factors included in their empirical analysis down to 12. Groenewoller et al. (2001) include mid-cap growth and value, large-cap, small-cap, international bonds, international stocks, and New Zealand listed property. The latter inclusion suggests relaxation of the requirement of factors being mutually exclusive (as listed property typically is included in the other equity indices). Lucas and Riepe (1996) include large-cap value, large-cap growth, small-cap value, small-cap growth, international bonds, long-term bonds, intermediate-term bonds, international stocks, and cash. Sharpe (1992) includes large-cap value, large-cap growth, medium-cap, small-cap, bills (i.e. cash-equivalents), long-term government bonds, intermediate-term government bonds, mortgage-related securities, non-U.S. bonds, European stocks and Japanese stocks. Buetow et al. (2001) suggest, apart form the usual factors (value, growth, etc.), inclusion of different types of bonds,

different categories of growth and value stocks, geographically specific international stocks, and also industry sectors.

Estimation

The aim of style analysis is to pick the set of betas which best explain asset class exposures over time. This set of exposures is the one for which the *variance* of the residuals is the least, whereas in an OLS estimation the aim is to pick the set of betas for which the *sum* of the squared residuals is the smallest. Two extra restrictions are to be placed on the regression. Firstly, the betas cannot be negative, and secondly, the sum of the betas must sum to unity. The betas cannot be negative because we assume no negative (or short) holdings in any asset classes or industry sectors, and they must sum to unity because the weightings in the portfolio are proportions out of 100% [22]. Placing these restrictions on the regression will result in slightly lower R-squared values compared to those obtained using an unrestricted regression (Sharpe, 1992).

3.2.2 Does style matter?

Style analysis would only be useful if the investment styles identified reflect distinguishable market behaviour, that is – if they differ as financial assets. Indro, Jiang, Hu and Lee (1998) address the question of whether this is the case. They survey a sample of U.S. managed funds between 1993 and 1995, and find that style does matter. They find that, on a risk-adjusted return basis, large capitalisation growth stock-oriented funds were the worst performing group in the sample, whereas medium capitalisation growth and small capitalisation growth stock-oriented funds generated the highest returns. The latter funds were, however, much less diversified and had higher total risk than other funds with more balanced exposures between

[22] Placing such restriction on a regression requires quadratic programming. This was solved somewhat indirectly using a non-linear regression in SPSS with the restrictions. By adding a constraint to the model the usual OLS objective is equivalent to the objective of minimisation of the variance of the residuals.

these asset classes. (This group of funds seems to match the observed descriptions of SRI funds.) The large capitalisation value stock-oriented funds attained the lowest total risk with no decrease in total return, and appeared to be the most mean-variance efficient style-consistent funds. Findings from such analyses may be sensitive to the choice of time-frame and market for which an analysis is undertaken.

As long as style matters to financial performance, style analysis represents a useful approach in determining how funds are likely to behave as financial assets.

3.2.3 How may style analysis contribute to the understanding of SRI funds?

The strongest argument for screened investment portfolios being inherently riskier than un-screened portfolios is the potential for larger diversifiable risk. This is because a screened portfolio has a smaller universe than an un-screened portfolio. If the screening process excludes investments of equal proportions across all sectors and asset classes, the theoretical increase in the risk-level will be limited to merely a smaller investable universe. However, screening might involve heavier reductions of available investments in some sectors or asset classes relative to others. This will result in risk stemming from over and under-exposures to sectors and/or asset classes.

Style analysis may provide some evidence of whether SRI funds are more likely to be more heavily exposed to certain asset classes than comparable non-SRI funds, such as what has been suggested in the first part of the literature review (see, for instance, Kurtz, 1997).

3.2.4 Limitations of style analysis

Style analysis, like any other analytical tool, has its limitations and should always be applied with care and always with the objective of the analysis in mind.

It is important to acknowledge that the estimated betas are biased because they are constrained and are not as reliable for interpretation as they would be using an unconstrained regression, even if the R-squared values are high. It is therefore difficult to judge statistical significance of the estimates.

The return series of factors included in style analyses are very likely to be relatively highly correlated with each other. Multicollinearity, which is very likely to occur when the return series of the included factors are highly correlated, implies that the estimated factor betas are less reliable as indicators of factor exposure.

Buetow et al. (2000) do not stress the implications of multicollinearity in their study dedicated to the weaknesses of style analysis, but give emphasis to the problem of subjectivity in perceptions and differences in definitions of investment styles. They point to several cases where fund managers have been surprised by seeing their portfolios classified quite differently to how they are marketed, and conclude that differences in definitions of styles is the main source of inconsistency of results and that the results may well be very misleading and should not be relied upon. Despite their strong criticism of style analysis, Buetow et al. (2000) allow that fund managers can construct their own benchmarks matching their own individual perceptions of styles. This criticism would not apply to the same extent if the funds under investigation and their benchmark indices are using the same definitions of styles.

Finally, changes in asset classes over time, if they are frequent and significant, will disturb the consistency of the style analysis. A set of factor betas calculated using style analysis provides an indication of how the changes in return have matched return on the different factor proxies over a period of time, on average. If the factor exposures change significantly over time this will affect the reliability of the estimated betas. A "rolling window" of style exposures is typically used for the purpose of investigating the stability of style exposures over time (Sharpe, 1992).

The next chapter discusses the methodology and analysis of the research undertaken in the present study.

4. METHODOLOGY AND ANALYSIS OF THE RESEARCH UNDERTAKEN

4.1 The SRI funds and the benchmark indices included in the analysis

The SRI funds included in the analysis are divided into two main groups, namely Australian SRI funds and Australian superannuation SRI funds. These two groups are included in the Morningstar Australian Equity Trusts - General sub-category and the Australian Superannuation Equity – General sub-category, respectively.

The selection of SRI funds to be included in the analysis was limited by the number of Australian SRI funds available and how long the funds had been operating for. All funds for which returns-series were available for at least two years were included amongst those available through Morningstar. Six SRI funds and five superannuation SRI funds fulfilled these criteria, although two of the superannuation SRI funds, whilst being individual funds, were from the same investment pool and therefore only one of them was included in the sample.

To ensure consistency in terms of index calculation methodology, the sub-category indices are also provided by Morningstar. The Morningstar Australian Equity Trusts General (MAETG) Index is used as a benchmark for the Australian equity SRI fund. This index includes all Australian equity trusts under the general category. Also, the Morningstar Superannuation Australian Equity General (MSAEG) Index is used as a benchmark for the superannuation Australian equity SRI funds. This index includes all Australian Superannuation funds listed under the superannuation Australian equity general category [23].

[23] Please note that Morningstar uses the term "general" as including all funds, superannuation and ordinary managed trusts, that are not grouped under any other category (such as SRI funds, which are grouped under the miscellaneous category by Morningstar). Throughout this paper I use the term "general" when referring to ordinary SRI funds as opposed to superannuation SRI funds.

All included indices aim to provide a fair comparison between the funds themselves, against other types of investments, against peer group averages and against market indices (Morningstar Performance Calculation Methodology – Technical Bulletin, n.d.). The indices are total return indices, with reinvestment of all distributions back into the scheme adjusting for any capital re-organisation. Performance measures are based on unit prices and declared rates that are net of all ongoing fees assessed against the fund and reflected in the fund unit prices and declared rates. Morningstar does not adjust for entry and exit fees. The indices are weighted by market capitalisation (Morningstar Performance Calculation Methodology – Technical Bulletin, n.d.).

Table 1 lists the SRI funds included, their start date, and other relevant information made available.

4.2 Preliminary observations

In order to provide a starting point for the analysis of these funds the average monthly raw returns and their variances are provided in Table 2. The average monthly returns and their variances were calculated from the total accumulated returns, and are provided for the full period since the start of the fund, the last 3-year period and the last 2-year period. Table 2 implies a consistent out-performance of the Australian Ethical fund, the two Tower SRI funds and the Glebe Blue Chip fund compared to the MAETG Index. The Challenger SRI fund and the Glebe Mid Cap fund seems almost consistently to have had lower returns than the benchmark index. The first of the Tower Super Ethical funds had higher returns than the MSAEG Index only for the last 2-year period, but all the other superannuation SRI funds consistently had higher returns than the benchmark index.

Table 1 – Australian SRI funds and benchmark indices included in the study

	Start Date	Strategies / Ethical Investor Corporate Monitor SRI Funds Ratings*	Asset allocation
Australian Equity SRI Funds			
Challenger SRI fund	14 Apr 1989	Listed ASX securities ★★★★	10.9% cash, 0.2% Australian Property Securities, 89.0% Australian Shares (Morningstar 2001)
Australian Ethical	19 Sep 1994	Australian equities	60-69% Australian shares, 0-20% international listed equities, 0-20% unlisted equities and convertible debt, 5-16% cash (Morningstar, 2001)
Tower Ethical Growth	1 Dec 1998	★★★	
Tower Ethical NEF	1 Dec 1998	★★★	
Glebe Blue Chip	25 Jul 1997	Top 100 ASX securities ★★★	70-95% Australian shares, 0-25% fixed interest securities, 5-30% cash (Morningstar 2001)
Glebe Mid Cap	25 Jul 1997	ASX securities ranked between 50th-150th by market cap. ★★★	70-95% Australian shares, 0-25% fixed interest securities, 5-30% cash (Morningstar, 2001)
Relevant index			
Morningstar Australian Equity Trusts – General (MAETG)			
Australian Superannuation SRI Funds			
Tower Super Ethical Group 1	31 Jan 1995	★★★	90-100% Australian shares, 0-10% cash (Tower Managed Funds, 2001)
Tower Managed Super Ethical Group 2	31 Jan 1995	★★★	90-100% Australian shares, 0-10% cash (Tower Managed Funds, 2001)
Australian Ethical Super Large	31 Dec 1998	Large stocks	49.49% top 100 listed equities (by market cap), 37.5% other listed equities, 8.64% cash, 4.37% Australian properties (Australian Ethical Superannuation, 2001)
Australian Ethical Super Equities	31 Dec 1998	Small stocks	21.35% top100 listed equities (by market cap), 61.93% other listed equities, 13.06% cash, 3.65% unlisted equities and convertible debt (Australian Ethical Superannuation, 2001)
Relevant index			
Morningstar Superannuation Australian Equity – General (MSAEG)			

* This measure rates how well the funds are specifically designed to meet the needs of ethical investors by a number of criteria, including historical performance, corporate resources, transparency in terms of investment objectives and ethical policy. One star indicates poor performance, and five stars indicates an "excellent investment with excellent ethical merit".

Sources: Ethical Investment magazine (2001 issue 4, pp 51-58), Morningstar (2001), Tower Managed Funds (2001), Australian Ethical Superannuation (2001).

Table 2 – Australian SRI funds: Average Monthly Returns and Variances

fund		*Average Monthly Return*	*Variance of Monthly Returns*
MAETG	*Jun92-Aug01*	0.007263	0.003334
	Aug98-Aug01	0.009047	0.001011
	Aug99-Aug01	0.006760	0.000783
Challenger SRI fund	*Jun92-Aug01*	0.007353	0.000555
	Aug98-Aug01	0.005465	0.000780
	Aug99-Aug01	0.005513	0.000757
Australian Ethical	*Sep94-Aug01*	0.010513	0.001059
	Aug98-Aug01	0.014448	0.001158
	Aug99-Aug01	0.014889	0.001278
Tower Eth. Growth	*Dec98-Aug01*	0.009135	0.001423
Tower Ethical NEF	*Dec98-Aug01*	0.008514	0.001394
Glebe Blue Chip	*Jul97-Aug01*	0.008670	0.001053
	Aug98-Aug01	0.009007	0.000846
	Aug99-Aug01	0.007988	0.000665
Glebe Mid Cap	*Jul97-Aug01*	0.004384	0.001708
	Aug98-Aug01	0.007393	0.001465
	Aug99-Aug01	0.002728	0.001538
MSAEG	*Jun92-Aug01*	0.009009	0.002070
	Aug98-Aug01	0.008771	0.000788
	Aug99-Aug01	0.006608	0.000626
Tower Sup. Eth.1	*Jan95-Aug01*	0.008559	0.001471
	Aug98-Aug01	0.009504	0.000984
	Aug99-Aug01	0.008842	0.000946
Tower Sup. Eth.2	*Jan95-Aug01*	0.010158	0.000940
	Aug98-Aug01	0.008979	0.000979
	Aug99-Aug01	0.008493	0.000946
Aust. Eth. Sup. Lrg.	*Dec98-Aug01*	0.014287	0.000938
Aust. Eth. Sup. Equit.	*Dec98-Aug01*	0.013658	0.000870

In terms of variability of returns, the average variability of returns for the general SRI funds is lower for the full period, higher for the last 3-year period and higher also for the last 2-year period compared to the MAETG Index. The Challenger SRI fund and the Glebe Blue Chip fund have consistently lower variability of returns, whereas the others have higher variability of returns compared to the benchmark index. The superannuation SRI funds, on average, have lower variability of returns for the full period, higher variability of returns for the last 3-year period and also for the last 2-year period compared to the MSAEG Index. All the superannuation SRI funds tend to have higher variability of returns compared to the benchmark index.

Variability of returns thus tends to be higher for individual SRI funds, both general and superannuation, compared to the relevant benchmark indices. One would expect, however, that the diversity of a fund index gives a lower variability of returns than for individual funds.

These figures are not very reliable – they are not risk-adjusted, and are not tested for statistical significance. These figures are only meant to facilitate a starting point and an indication of how the funds behave. More in-depth analysis is provided in part 4.3 and 4.4.

4.3 Assessing fund performance – The Jensen alpha

4.3.1 Model specification and data collection

The basic four-factor model used in this analysis is presented as follows

$$R_{it}-R_{ft} = \alpha_i+\beta_{mi}(R_m-R_{ft})+\beta_{si}(R_{st}-R_{lt})+\beta_{gi}(R_{gt}-R_{vt})+\beta_{di}(R_{dt}-R_{ft})+\varepsilon_i \qquad (7)$$

where α_i = risk-adjusted excess return on fund i;

R_{it} = return on fund i in period t;

R_{ft} = the risk-free return in period t;

$R_m - R_f$ = the market factor;

β_{mi} = the sensitivity of changes in returns on fund i to the market factor ;

$R_{st} - R_{lt}$ = the size factor;

β_{si} = the sensitivity of changes in return on fund i to the size factor;

$R_{gt} - R_{vt}$ = the style factor;

β_{gi} = the sensitivity of changes in returns on fund i to the style factor;

$R_{dt} - R_{ft}$ = the domestic fixed-interest factor;

β_{di} = the sensitivity of changes in returns on fund i to the domestic fixed-interest factor; and

ε_i = random error term.

The explanations of the included factors, and the proxies used for the factors, are provided in Table 3. The S&P/ASX Small Ordinaries Index includes the top 300 stocks (S&P/ASX 300) by market capitalisation, except for the top 100 (S&P/ASX 100). This index therefore includes the 101st through to the 300th largest stock by market capitalisation. This index therefore omits the 301st through to the smallest stock by market capitalisation. The number of omitted stocks vary with the total number of companies listed. A total return index for these omitted stocks was constructed, using the S&P/ASX 300 and the ASX All Ordinaries Total Return Indices and available yearly figures for the proportions of the S&P/ASX 300 out of the ASX All Ordinaries [24]. These proportions vary from 91.21% in June 1992 to a peak of 96.06% in December 1998, and to 95.21% in December 1999 (Webb, Standard & Poors, personal communication, 6. November 2001) (newer data was not found). The constructed index was named "very small capitalisation".

[24] These proportions are provided in part 7.1 of the appendices.

Table 3 - Factors included in the Jensen measure and proxies

Notation	*Explanation*	*Proxy*
R_f	risk-free return	Australian 90-day Treasury Note
R_m	market factor	ASX All Ordinaries Accumulation Index
R_s	returns on small capitalisation stocks	ASX Small Ordinaries Accumulation Index
R_{vs}	returns on very small capitalisation stocks	ASX smallest 200 accumulation index (self-constructed)
R_l	returns on large capitalisation stocks	ASX top100 Accumulation Index
R_g	returns on growth stocks	MSCI Growth Total Return Index Australia
R_v	returns on value stocks	MSCI Value Total Return Index Australia
R_d	returns on fixed interest securities	UBSWA Composite All Maturities Bond Total Return Index

Consequently, one model is specified using two different proxies for the small capitalisation stocks. The model using the very small capitalisation stock is specified with R_{vs} instead of R_s as the symbol of the returns on the very small stocks [25].

The returns-series for the factor proxies required for this analysis were accessed through Datastream. End-of-the-month data was used for fund and factor returns using total returns.

The Australian 90-day Treasury Note rate was used as a proxy for the risk-free rate, in accordance with standard practice. The ASX All Ordinaries Total Return Index was used as a proxy for the market return. Drew & Stanford (2001) used the

top 100 companies total return index as a proxy for the market return, but this index will not include returns for smaller stocks. The ASX All Ordinaries Index includes 99% of all Australian listed companies, and this index is chosen to represent the market factor.

The MSCI Growth and Value Total Return Indices were used to proxy for growth and value stocks. These indices split companies by their book-to-market ratio, so that the 50% of the stocks with the highest book-to-market ratios are included in the value-index and the remaining stocks are included in the growth-index. The MSCI Growth and Value indices do, however, only include the top 60% of listed stocks by market capitalisation (MSCI, 2001). The UBSWA Composite All Maturities Bond Total Return Index was used to proxy for the domestic fixed interest return. The S&P/ASX Small Ordinaries Total Return Index was used as a proxy for returns on small capitalisation stocks, and the S&P/ASX 100 Total Return Index was used as a proxy for returns on large capitalisation stocks. The self-constructed very small capitalisation total return index was used as a proxy for the otherwise omitted smallest stocks listed.

All returns series, including the fund return series, were converted into series of monthly returns from the total reinvested return, i.e. month-to-month changes in reinvested holdings were calculated.

Linear regressions were run for each fund and the indices, and the parameters were estimated by Ordinary Least Squares (OLS), with heteroskedasticity (White) consistent coefficient covariance [26].

[25] The model is specified $R_{it}-R_{ft}=\alpha_i+\beta_{mi}(R_m-R_{ft})+\beta_{si}(R_{vst}-R_{lt})+\beta_{gi}(R_{gt}-R_{vt})+\beta_{di}(R_{dt}-R_{ft})+\varepsilon_i$, where R_{vst} represents return on very small capitalisation stocks minus return on large capitalisation stocks at period t.

[26] This is a menu option for linear regressions using the EViews software package.

Table 4 – Jensen alphas calculated using the "small" proxy

Model: $R_{it}-R_{ft} = \alpha_i + \beta_{mi}(R_m - R_{ft}) + \beta_{si}(R_{st} - R_{lt}) + \beta_{gi}(R_{gt} - R_{vt}) + \beta_{di}(R_{dt} - R_{ft}) + \varepsilon_i$

fund		α	*t-stat.*	β_m	β_s	β_g	β_d	*Adj.* R^2
MAETG	Jun92-Aug01	0.0026*	2.5143	0.8176	0.0966	0.0646	0.1091	0.9145
	Aug98-Aug01	0.0036*	2.0987	0.8428	0.1290	-0.0120	0.0854	0.9013
	Aug99-Aug01	0.0016	0.7743	0.8642	-0.0103	0.0714	0.2133	0.9056
Challenger SRI	Jun92-Aug01	-0.0013	-0.7731	0.4065	0.1046	-0.0842	0.1655	0.4424
	Aug98-Aug01	-0.0015	-0.3763	0.3751	-0.0597	-0.0362	0.0159	0.1674
	Aug99-Aug01	-0.0015	-0.3137	0.4898	-0.1848	0.0220	-0.1595	0.2544
Australian Ethical	Sep94-Aug01	0.0022	1.4276	0.7999	0.1636	0.0485	-0.1856	0.7930
	Aug98-Aug01	0.0023	1.2296	0.7989	0.0407	0.0863	0.1500	0.8464
	Aug99-Aug01	0.0020	0.6340	0.9016	0.0623	0.0074	0.2361	0.8560
Tower Eth. Gr.	Dec98-Aug01	0.0019	0.6884	1.0440	0.0505	0.0858	0.3299	0.8304
Tower Eth. NEF	Dec98-Aug01	0.0013	0.4879	1.0323	0.0521	0.0847	0.2649	0.8249
Glebe Blue Chip	Jul97-Aug01	0.0025	1.2001	0.7794	0.0824	0.0647	0.0109	0.7854
	Aug98-Aug01	0.0028	1.1453	0.6811	0.1205	-0.0474	0.2020	0.7159
	Aug99-Aug01	0.0042	1.2731	0.6179	-0.0197	0.1414	-0.0964	0.5606
Glebe Mid Cap	Jul97-Aug01	0.0026	0.6657	0.7466	-0.0203	0.1451	0.1458	0.6062
	Aug98-Aug01	0.0038	0.8586	0.7495	0.1397	0.3860	-0.2374	0.5527
	Aug99-Aug01	0.0030	0.5118	0.7509	0.4882	0.0858	-0.1904	0.5495
MSAEG	Jun92-Aug01	0.0012	1.5777	0.7756	0.4383	0.1450	-0.3713	0.9480
	Aug98-Aug01	0.0025*	2.1105	0.7522	0.0980	0.0410	0.0860	0.9372
	Aug99-Aug01	0.0023	1.3062	0.7360	0.0296	0.1117	0.0338	0.9001
Tower Sup. Eth.1	Jan95-Aug01	0.0009	0.5978	0.7251	0.1813	0.0087	-0.1202	0.7627
	Aug98-Aug01	0.0028	1.5036	0.8030	0.0862	0.0388	0.1582	0.8525
	Aug99-Aug01	0.0024	0.7430	0.9012	0.0625	0.0078	0.2413	0.8560
Tower Sup. Eth.2	Jan95-Aug01	0.0023	1.4347	0.7996	0.1633	0.0487	-0.1817	0.7932
	Aug98-Aug01	0.0023	1.2310	0.7989	0.0866	0.0405	0.1524	0.8466
	Aug99-Aug01	0.0020	0.6333	0.9015	0.0622	0.0077	0.2398	0.8559
Aust. Eth. S.. Lrg.	Dec98-Aug01	0.0010	0.721	0.5434	0.4797	-0.0546	-0.4932	0.7897
Aust. Eth. S.. Equ.	Dec98-Aug01	0.0007	0.673	0.5094	0.4557	-0.0829	-0.2812	0.7979

*Coefficients are significant at the 5% level.
Parameters are estimated by OLS with heteroskedasticity (White) consistent covariance.

Table 5 – Jensen alphas calculated using the "very small" proxy

Model: $R_{it}-R_{ft} = \alpha_i+\beta_{mi}(R_m-R_{ft})+\beta_{si}(R_{vst}-R_{lt})+\beta_{gi}(R_{gt}-R_{vt})+\beta_{di}(R_{dt}-R_{ft})+\varepsilon_i$

fund		α	*t-stat.*	β_m	β_s	β_g	β_d	*Adj.* R^2
MAETG	Jun92-Aug01	0.0013	1.2794	0.7722	-0.1995	0.0511	0.0900	0.9245
	Aug98-Aug01	0.0018	1.0359	0.7949	-0.1460	0.0979	0.0028	0.9244
	Aug99-Aug01	0.0004	0.2060	0.8041	-0.1112	0.0553	0.1399	0.9256
Challenger SRI	Jun92-Aug01	-0.0024	-1.5244	0.3621	-0.1784	-0.0946	0.1521	0.4531
	Aug98-Aug01	-0.0033	-0.8263	0.3267	-0.1499	-0.0950	-0.0807	0.1979
	Aug99-Aug01	-0.0027	-0.5215	0.3601	-0.2136	-0.0504	-0.3365	0.2790
Australian Ethical	Sep94-Aug01	0.0002	0.1591	0.7411	-0.1876	0.0458	-0.2076	0.7919
	Aug98-Aug01	0.0003	0.1618	0.7489	-0.1482	0.0623	0.0920	0.8697
	Aug99-Aug01	0.0009	0.3271	0.8706	-0.0683	0.0148	0.2060	0.8575
Tower Eth. Gr.	Dec98-Aug01	-0.0002	-0.0735	0.9752	-0.1581	0.0594	0.2425	0.8504
Tower Eth. NEF	Dec98-Aug01	-0.0008	-0.2960	0.9634	-0.1585	0.0586	0.1770	0.8453
Glebe Blue Chip	Jul97-Aug01	0.0013	0.5629	0.7135	-0.1146	0.1183	0.0835	0.7958
	Aug98-Aug01	0.0013	0.5177	0.6399	-0.1288	0.0878	0.1110	0.7349
	Aug99-Aug01	0.0028	0.7826	0.5431	-0.1373	0.1198	-0.1886	0.5979
Glebe Mid Cap	Jul97-Aug01	0.0005	0.6996	0.8036	0.1044	0.2514	-0.1568	0.5023
	Aug98-Aug01	0.0041	0.7631	0.7839	0.1358	0.2217	0.0232	0.4590
	Aug99-Aug01	0.0031	0.4395	0.9477	0.2902	0.2438	0.1017	0.4300
MSAEG	Jun92-Aug01	0.0011	0.2260	0.7520	-0.0903	0.0618	0.0065	0.9463
	Aug98-Aug01	0.0018	1.3947	0.7362	-0.0451	0.0948	0.0824	0.9378
	Aug99-Aug01	0.0017	0.9120	0.7192	-0.0364	0.1148	0.0170	0.9012
Tower Sup. Eth.1	Jan95-Aug01	-0.0009	-0.5900	0.6551	-0.2611	-0.0041	-0.1365	0.7688
	Aug98-Aug01	0.0008	0.4905	0.7544	-0.1444	0.0626	0.1013	0.8745
	Aug99-Aug01	0.0012	0.4613	0.8706	-0.0677	0.0153	0.2116	0.8573
Tower Sup. Eth.2	Jan95-Aug01	0.0003	0.1696	0.7410	-0.1871	0.0460	-0.2037	0.7920
	Aug98-Aug01	0.0003	0.1652	0.7490	-0.1478	0.0626	0.0945	0.8697
	Aug99-Aug01	0.0009	0.3280	0.8707	-0.0680	0.0151	0.2099	0.8574
Aust. Eth. S.. Lrg.	Dec98-Aug01	-0.0008	-0.3340	0.6409	0.2361	0.1141	-0.5058	0.7963
Aust. Eth. S.. Equ.	Dec98-Aug01	-0.0011	-0.4110	0.6107	0.2444	0.0822	-0.2837	0.8094

*Coefficients are significant at the 5% level.
Parameters are estimated by OLS with heteroskedasticity (White) consistent covariance.

4.3.2 Analysis of the results

The estimated alphas estimated over the full period since the start of the funds, as well as over the most recent available 3-year and last 2-year periods, are provided in tables 4 and 5, where Table 4 displays the estimated betas using the small proxy for the size factor and Table 5 displays the estimated betas using the very small proxy for the size factor.

Autocorrelation, or serial correlation, is tested for and found not to be present in the monthly observations. The R-squared values are adjusted by the degrees of freedom (the excess of the number of observations over the number of coefficients, including the intercept) for the individual regressions (Studenmund, 2001).

The alpha-values for the general SRI funds and the superannuation SRI funds are analysed in sequence. Significance of alphas is determined by the *t*-statistic for a maximum level of 5%, using two-tailed *t*-tests for statistical significance of coefficients.

The general SRI funds

The choice of proxy for the small capitalisation stocks does not appear to have a large or consistent effect on the R-squared values. The MAETG Index alphas are only significantly different from zero when using the standard size factor, and only for the full period and the last 3-year period over which the index out-performed by 26 and 36 basis points per month (or 3.12% and 4.32% per annum) on average, respectively.

All general SRI funds alphas are insignificantly different from zero. The Challenger SRI fund and the Glebe Mid Cap fund have relatively low adjusted R-squared values, implying that the models do not explain much more than 50-60% of the variation in returns [27].

[27] The adjusted R^2 for these funds suggest no consistency in model "preference" in terms of the proxy used in the size factor.

Comparing the general SRI funds to the benchmark index we cannot accept the hypothesis that all SRI funds perform differently to the benchmark index for all time periods using both proxies for the size factor. The benchmark index over-perform for the full period and the last 3-year using the "small" proxy in size factor only, suggesting the general SRI funds under-performed compared to the benchmark over these time periods.

The superannuation SRI funds

The MSAEG Index shows no "preferences" in terms of model specification judging by the adjusted R-squared values. The index alphas are significant, at the 5% level, only for the last 3-year period, and only when using the "small" proxy in the size factor. The magnitude of the alpha is 25 basis points per month (or 3% per annum).

The alphas for the superannuation SRI funds are all insignificantly different from zero, for all time periods using both proxies in the size factor [28].

Comparing the superannuation SRI fund to the benchmark index we cannot accept the hypothesis that the superannuation SRI fund in the sample performed differently to the benchmark index over all time periods using all models. The benchmark index alpha is significantly different from zero only over the last 3-year period and only using the "small" proxy in the size factor, suggesting that the superannuation SRI funds under-performed compared to the benchmark index over the last 3-year period.

In conclusion, the results from this analysis do not support the assumption that SRI funds, general and superannuation, consistently perform differently compared to their benchmark indices over all time periods. The Jensen alphas for the general and superannuation SRI funds are not significantly different from zero over the August 1999-August 2001 period, nor are the alphas for the respective

[28] The superannuation SRI funds seemed to take a mild "preference" to the models using the very small proxy in the size factor.

benchmark indices. There is, however, some evidence that both the general and the superannuation SRI funds performed differently compared to their respective benchmark indices over the August 1998-August 2001 period, and that they also performed differently compared to the benchmark index over the full period [29].

4.3.3 Model-specific limitations

The low adjusted R-squared values of some of the fund regressions imply that the model used for these funds or the benchmark proxies are not very well specified. The Challenger SRI fund stands out in this context, with extremely low adjusted R-squared values, but also the Australian Ethical fund and to a certain extent the Glebe Mid Cap fund have low R-squared values. The adjusted R-squared values for the superannuation SRI funds are consistently high, however.

Tracking error between the benchmark indices and the funds should be minimised by using the Morningstar sub-category indices for general Australian equity trusts and superannuation Australian equity funds, which aim to take account of such fees and costs as far as is possible [30]. Limitations may remain, however, depending on how well the Morningstar indices reflect real reinvested returns for the funds included, net of all costs and fees.

Another limitation of this analysis it that, ideally, the benchmarks should reflect the stated investment style of the fund. Funds labelled "growth" or "large", for instance, should arguably be compared to growth-style and large-style fund benchmarks (such as the Industry Indices used by Cummings (2000)). Since the objective of the analysis is to investigate whether SRI funds perform differently to non-SRI funds, general and superannuation, rather than how the individual SRI funds perform compared to non-SRI funds with similar style, following their stated

[29] This contradicts the findings by Cummings (2000), whose findings did not include any significant over-performance of the Australian Ethical fund. The models used do, however, give very low adjusted R-squared values when analysing the returns from this fund.
[30] See part 4.1 for more information on the Morningstar Index methodology.

investment style, such benchmarks are not used in this study [31].

The next section explores risk by exposure to asset classes in the context of Australian SRI funds.

4.4 Assessing risk by exposure

The objective of this part of the analysis is to assess the extent to which, if at all, SRI funds' exposures to asset classes and sectors of the economy differ from that of managed funds in general, judging from how they behave in the market place. The objective of the analysis is *not* to evaluate the styles of the SRI funds in terms of how appropriate they might be. The objective of the analysis is solely to determine whether they differ from the respective benchmark indices in terms of investment styles, as financial assets.

This objective is approached from two different angles. Firstly, the funds' exposures to asset classes are examined, where the style factors include book-to-market value, size, fixed interest, cash and international equity. Secondly, the funds' exposures to industry sectors are examined. The latter analysis explores fund exposures, firstly, to a broad breakdown of industry sectors, and secondly, to a more specific breakdown of these. Whilst the former type of style analysis has frequently been applied and discussed by professionals, this latter form of analysis is not evident in the existing literature (but has, as mentioned earlier, been suggested by Buetow et al., 2001). The reason for this may be that non-SRI funds are typically assumed to be diversified across industries and economic sectors, in which case "inclusion of factors related to differences in industry and sector returns will add little, if any, explanatory power to a model designed to explain fund returns" (Sharpe, 1992 p. 9). However, because SRI funds have, in the literature, been assumed *not* to be as well diversified across industries as non-SRI funds, it appears

[31] Roll's (1992) critique of the minimisation of tracking error does not apply to the present study, as the objective is to investigate whether there are any significant differences in fund returns compared to the indices. These indices do not represent a market portfolio proxy, but rather a weighted average of all available Australian equity funds under the general and superannuation categories

an interesting application, and will provide important evidence to the SRI fund debate.

4.4.1 Style analysis with asset classes as explanatory variables

Objectives

This part of the study applies style analysis to investigate whether the screening practices amongst Australian SRI funds give rise to over and under-exposures to style-factors compared to the relevant benchmark indices. Differences in exposures between the SRI funds and their respective benchmark indices may indicate that SRI funds differ from comparable non-SRI funds in terms of style. Differences in fund exposures may arise from sources other than screening practices, but if we make the assumption that SRI fund managers are not significantly different in their stock-picking skills compared to other fund managers we are left with risk stemming from screening practices of SRI funds.

Model specification

The size of the market surveyed naturally places limitations on how many factors can justifiably be included in the model. Whereas larger markets, particularly the U.S. market, have a large and well diversified universe of investable securities and with an extensive range of benchmark indices available, smaller markets, such as Australia, have a dramatically smaller universe of investable securities and a smaller range of benchmark indices available. The model used in this analysis is an eight-factor model, where the included factors are large-capitalisation growth, large-capitalisation value, medium-capitalisation, small-capitalisation, very small-capitalisation, fixed interest, cash equivalents, and international equity [32]. These

[32] Proxies with growth/value splits of stocks smaller than those included in the top 60% by market capitalisation were not found for the Australian market, among those provided by Datastream.

factors very closely fulfil the requirement that the factors must be mutually exclusive. They are, of course, selected with the constraint of the index availability.

Choosing and gathering the data used to proxy for the factors

Table 6 illustrates the break-down of size and book-to-market specific indices relevant to the chosen factors as of June 2000 [33], and Table 7 summarises the factors included in the model and the proxies used for these factors.

Table 6 – Percentile Splits for Market Capitalisation

	Percent of market capitalisation	Number of companies included
(MSCI Growth + Value)	(60 %)	(not available)
S&P/ASX 50	77.87 %	50
S&P/ASX Mid 50	8.35%	50
S&P/ASX Small Ords	7.52%	200
ASX All Ords	99%*	492
All listed companies	100%	1263

* This is the percentage of all listed companies included into ASX All Ordinaries index, it is not the sum of the listed proportions.

(Sources: ASX Monthly Index Analysis, June 2000, and the MSCI Methodology Book, 2001)

The MSCI growth and value indices are used as proxies for large-capitalisation growth and value stocks. As Table 5 indicates, the MSCI growth and value indices account for the top 60% of Australian listed companies by market

[33] Such information is available in the Monthly Index Analysis booklets published by the ASX Operations Pty Ltd. The publication of these, however, ceased in June 2000, and the figures provided in Table 5 therefore represents the most recent information available. Because the S&P/ASX Mid50, and Small Ordinaries indices used in the present study were constructed after June 2000 by Standard & Poor (these indices were then constructed based on historical data, starting from June 1992), the June 2000 publication represents the only readily available source of this information.

Table 7 – Factors included in the style by asset class analysis and proxies

Factor	*Description*	*Proxy**
Large-cap growth	Stocks in the top 60% percentile by market capitalisation, with high book-to-market ratios	MSCI Growth Total Return Index - Australia
Large-cap value	Stocks in the top 60% percentile by market capitalisation, with low book-to-market ratios	MSCI Value Total Return Index - Australia
Mid-cap	The smaller 50 of the top 100 stocks listed on the ASX, by market capitalisation	S&P/ASX Midcap 50 Total Returns Index
Small-cap	The smaller 200 of the top 300 stocks listed on the ASX, by market capitalisation	S&P/ASX Small Ordinaries Total Return Index
Very small-cap	The remaining stocks, among those included in the ASX All Ordinaries, after the top 300 stocks are taken out	Very small ordinaries total return index (self-constructed)
Fixed interest	Domestic bonds of all maturities	UBSWA Composite All Maturities Bond Total Return Index
Cash	Cash equivalents with less than 3 months to maturity	Australian 90-day Treasury Note
International equity	All international stocks	MSCI World Accumulation Index

* All indices, including those used to construct the very small capitalisation index, were obtained through Datastream.

capitalisation [34], whereas the S&P/ASX top50 account for the top 77.87% as of June 2000. This means that 17.87% of the S&P/ASX top50 is potentially unaccounted for in the model as at June 2000. This is a potential weakness of the proxies. It is, however, only a problem to the extent that these value and growth indices are not reflective of the equivalent split in the S&P/ASXtop50. As a means of attempting to check whether the "missing" return series reduces the explanatory power of the model, the S&P/ASXtop100 Total Return Index was substituted for the MSCI

[34] This percentage will be increased to 85% by November 30 2001 (MSCI, 2001).

growth and value indices to see if this had any effect on the R-squared values. No significant effect on the R-squared values was evident, suggesting that no significant loss of explanatory power is incurred by omitting this proportion.

As anecdotal evidence suggests that SRI funds have a propensity to invest in small companies, the very small capitalisation index referred to in the performance analysis (section 4.3.1) was included.

The MSCI World Accumulation Index was used to proxy for international equity. No "world-ex-Australia" was available, and since Australia would account for a very small part of the world index it was assumed that this index would serve as a good proxy for international equity. This approach was also adopted by Groenewoller et al. (2001) when applying style analysis to New Zealand managed trusts.

The factors in the model are thus mutually exclusive, as close to exhaustive as possible given the resources available, and well in keeping with standard procedure. A correlation matrix of the included factor proxies is provided in part 7.2.1 of the appendices.

The model is given by

$$R_i = \beta_{gi}*(\textit{large-cap growth}) + \beta_{vi}*(\textit{large-cap value}) + \beta_{mi}*(\textit{mid-cap}) + \beta_{si}*(\textit{small-cap}) + \beta_{vsi}*(\textit{very small-cap}) + \beta_{bi}*(\textit{fixed interest}) + \beta_{ci}*(\textit{cash}) + \beta_{wi}*(\textit{int'l equity}) + \varepsilon_i \quad (8)$$

where R_i = return on fund i;

β_{gi} = fund i's sensitivity to returns on large-capitalisation growth stocks;

β_{vi} = fund i's sensitivity to returns on large-capitalisation value stocks;

β_{mi} = fund i's sensitivity to returns on medium-capitalisation stocks;

β_{si}	=	fund i's sensitivity to returns on small capitalisation stocks;
β_{vsi}	=	fund i's sensitivity to returns on very small capitalisation stocks;
β_{bi}	=	fund i's sensitivity to returns on fixed interest securities;
β_{ci}	=	fund i's sensitivity to returns on cash equivalents;
β_{wi}	=	fund i's sensitivity to returns on international equity;
ε_i	=	random error term.

Analysis of the results

The results of this analysis are presented in Table 8. Estimates for the full period (since start) is presented for all funds, and as the R-squared values and betas estimated tend to vary with the number of observations included in the regression, it is therefore necessary to include estimates for shorter time-periods in the table as well. Thus, estimates from the last 3 and 2-year periods are included for funds with longer histories. "Rolling windows" displaying changes in funds' factor exposures over time are not produced in this study as the histories of the majority of the funds included are very short [35].

The R-squared values suggest that the model is able to explain between 48% and 95% of fund returns. Most of the funds have acceptable R-squared values, however, the lower values suggest the return series of some funds are not as well explained by the model. The lowest R-squared values are found for the Challenger SRI fund (0.4871), Australian Ethical (0.5177) and the Australian Ethical Super Large (0.5412).

[35] Also, the magnitude of the R^2 appears to vary across the funds rather than over the individual funds' time-frames, implying that changing the number of included observations does not dramatically change the "goodness of fit" of the model.

Table 8 – Style analysis: Asset classes

fund	*large growth*	*large value*	*mid-cap*	*small*	*very small*	*fixed interest*	*cash*	*Int'l equity*	R^2
MAETG									
Jun92-Aug01	.2958	.2426	0	1326	.1329	.0989	.0371	.0601	.9275
Aug98-Aug01	.2694	.2122	.2432	.0428	.0189	0	.1475	.0660	.9108
Aug99-Aug01	.2478	.3347	.3125	.0264	0	.0124	0	.0662	.9515
Challenger SRI fund									
Jun92-Aug01	.0145	.2270	0	1184	.0749	.1320	.4333	0	.4871
Aug98-Aug01	.0456	.2594	.1767	0	0	0	.5183	0	.2809
Aug99-Aug01	.1235	.2903	.1746	0	0	0	.4115	0	.3870
Australian Ethical									
Sep94-Aug01	.0042	.0025	.0478	.4785	0	0	.3911	.0760	.5177
Aug98-Aug01	0	.0446	0	.4395	.0318	0	.3749	.1091	.4901
Aug99-Aug01	.0201	.0688	0	.5016	0	0	.2323	.1773	.6986
Tower Eth. Growth									
Dec98-Aug01	.3412	.3697	0	.2741	.0149	0	0	0	.8554
Tower Ethical NEF									
Dec98-Aug01	.3422	.3709	0	.2807	.0062	0	0	0	.8564
Glebe Blue Chip									
Jul97-Aug01	.2837	.1480	0	0	.2683	.0383	.1630	.0986	.8087
Aug98-Aug01	.2503	.1778	.2279	0	0	.1359	.0673	.1409	.7392
Aug99-Aug01	.2454	.1172	.2271	0	0	0	.2450	.1653	.7026
Glebe Mid Cap									
Jul97-Aug01	.0846	0	0	.2683	.3264	0	.1283	.1924	.6647
Aug98-Aug01	.0775	0	.2510	.2708	0	0	.1684	.2323	.6377
Aug99-Aug01	0	0	.3046	.3181	0	.0221	0	.3551	.7064
MSAEG									
Jun92-Aug01	.2817	.2163	.0350	.0907	.1541	0	.1853	.0370	.9565
Aug98-Aug01	.2694	.2122	.2432	.0428	.0189	0	.1475	.0660	.9339
Aug99-Aug01	.2475	.1945	.2550	.0574	0	0	.1607	.0849	.9278
Tower Sup. Eth.1									
Jan95-Aug01	.1991	.2308	0	.2697	0	0	.2514	.0490	.7903
Aug98-Aug01	.3183	.2854	.0888	.1757	0	.0526	.0793	0	.8520
Aug99-Aug01	.1811	.4222	.1819	.1726	0	.0423	0	0	.9041
Tower Sup. Eth.2									
Jan95-Aug01	.2637	.2286	0	.2876	0	0	.2074	.0126	.9087
Aug98-Aug01	.3195	.2834	.0831	.1777	0	.0495	.0868	0	.8509
Aug99-Aug01	.1813	.4227	.1818	.1724	0	.0419	0	0	.9042
Aust. Eth. Sup. Lrg.									
Dec98-Aug01	0	0	.0476	.3512	0	0	.3265	.2748	.6480
Aust. Eth. Sup. Equit.									
Dec98-Aug01	0	.0078	.1030	.3493	0	0	.4165	.1234	.5412

The general SRI funds

The MAETG Index is, according to the estimated model parameters, fairly equally exposed to the large growth and the large value factors, with magnitudes of 25-30%. Exposures to the mid-cap factor are of similar magnitudes for the last 3 and 2-year periods, but zero for the full period. Exposures to the small and the very small factors are similar but very varied, and of consistently lesser magnitudes than the large factors (0-13%). Exposure to the fixed interest and the cash equivalents factors are also very inconsistent, varying from zero to nearly 15%. Exposure to international equity is fairly constant at just over 6%.

When looking at the general SRI funds, no consistent pattern is found in terms of exposure to the growth and value factors. The Challenger SRI, Australian Ethical, and Glebe Mid Cap funds have much smaller exposures, the two Tower Ethical funds have moderately higher exposures and the Glebe Blue Chip fund has similar exposures to the growth factor when compared with the benchmark index. The Australian Ethical and Glebe Mid Cap funds have much smaller, the two Tower Ethical funds have much higher, the Glebe Blue Chip fund have moderately lower and the Challenger SRI fund has similar exposures to the value factor when compared to the benchmark index. The results indicate that the Tower Ethical Growth fund, whose name suggests higher exposure to growth stocks, has similar exposures to growth and value stocks.

The general SRI funds appear to have varying exposures to large stocks in total (as implied by adding the exposures to the large growth and large value factors). The two Tower Ethical funds have much higher, the Australian Ethical and Glebe Mid Cap funds have much lower and the Challenger SRI and Glebe Blue Chip funds give only slightly smaller exposures to the collapsed large factor. This therefore provides little support to the hypothesis that SRI funds have consistently lower exposures to large stocks compared to other funds.

In summary, the general SRI funds differ, amongst themselves, more in exposure to large stocks in total than in any particular direction between growth and

value stocks. These results do therefore not support the hypothesis that SRI funds differ from other funds in terms of exposure to growth or value stocks.

The MAETG Index shows an exposure to the mid-cap factor of zero for the full time period, but of 24% and 31% for the last 3 and 2-year periods, respectively. The general SRI funds have similar or lower exposures to this factor, but these exposures are all very inconsistent over time (possibly suggesting that the factor may tend to be inconsistent in its representation more so than that the funds are inconsistent in their exposures over time). The Australian Ethical and the two Tower Ethical funds have much lower, the Challenger SRI fund gives slightly lower and the two Glebe funds have similar exposures to the mid-cap factor compared to the benchmark index. Overall this may suggest general SRI funds have lower exposures, on average, to the mid-cap factor compared to other comparable funds.

The pattern of varying exposures to the mid-cap factor is almost exactly reversed in the exposures to the small factor. This actually seems to be the case for both the benchmark index and for all the general SRI funds. The Australian Ethical, Glebe Mid Cap and the two Tower Ethical funds give much higher exposures and the Challenger and Glebe Blue Chip funds give similar exposures to the small factor compared to the benchmark index. These results therefore mildly support the idea that SRI funds have higher exposures to small stocks than other funds.

No notable difference between the general SRI funds and the benchmark index is found when comparing exposures to the fixed interest factor. The estimated factor exposures are inconsistent over time with no visible pattern. In terms of the cash equivalents factor, the Challenger SRI and Australian Ethical funds give much higher, the two Glebe funds give slightly higher and the two Tower Ethical funds give similar exposures to this factor. This suggests the general SRI funds on average are more exposed to movements in the cash equivalents than the benchmark index.

No consistent pattern is found for the general SRI fund exposures to the international equity factor. The two Glebe funds give much higher, Australian Ethical fund gives slightly higher and the Challenger SRI and the two Tower Ethical

funds give similar exposures to the international equity factor when compared to the benchmark index.

The stated investment strategy of the Glebe Blue Chip fund, according to Morningstar (2001), is to invest in stocks among the top 100 stocks listed on the ASX, by market capitalisation. This implies that this fund should show higher exposures to the large and the mid-cap factors, which also is evident by the estimated betas (this evidence is stronger for the last 3 and 2-year periods). The Glebe Mid Cap fund aims, according to Morningstar (2001), to invest in the ASX securities ranked between the 50th and the 150th by market capitalisation. This implies that this fund should show higher exposures to the mid-cap and small factors, which is evident by the estimated betas. (This evidence is, again, stronger for the last 3 and 2-year periods.)

The superannuation SRI funds

The MSAEG Index has slightly higher exposures to the large growth factor (24-28%) than to the large value factor (19-21%). The exposures to the collapsed large factor are thus between 45% and 50% (hence lower than the MAETG Index). Exposures to the mid-cap and small factors are comparable to the MAETG Index. Exposures to the fixed interest factor are consistently zero, and exposures to the cash-equivalents factor are moderately higher compared to the MAETG Index. Exposures to the international equity factor are, however, similar.

The two Australian Ethical Super funds have much lower and the two Tower Super Ethical funds have similar exposures to the large factors compared to the benchmark index. In terms of the value factor, the two Tower Super Ethical funds have moderately higher and the two Australian Ethical Super funds have much lower exposures to this factor. As with the general SRI funds, it seems the superannuation SRI funds differ, amongst themselves, more in exposure to large stocks than in any particular direction between growth and value stocks. Again, no support is found for the idea of SRI funds differing from other funds in terms of exposure to growth or value stocks in any systematic way.

The two Tower Super Ethical funds have moderately higher and the Australian Ethical Super funds have much lower exposures to the large factors compared to the benchmark index. In terms of the mid-cap factor, the two Tower Super Ethical funds have moderately lower and the two Australian Ethical Super funds have much lower exposures to this factor. This may suggest superannuation SRI funds tend to have lower exposures to the mid-cap factor. The two Tower Super Ethical funds have much higher and the two Australian Ethical Super funds have very much higher exposures to the collapsed small factor compared to the benchmark index. This does not support the hypothesis that SRI funds have consistently lower exposures to larger stocks. The results do support the assumption of higher exposures to small stocks as measured by the small stocks, but not by the very small stocks.

In terms of exposure to the fixed interest factor, the two Tower Super Ethical funds have slightly higher and the two Australian Ethical Super funds have similar exposures to this factor compared to the benchmark index. The two Tower Super Ethical funds have slightly lower and the two Australian Ethical Super funds have much higher exposures to the cash equivalent factor. The two Tower Super Ethical funds have lower and the two Australian Ethical Super funds have much higher exposures to the international equity factor. This may suggest that superannuation SRI funds tend to have higher exposures to cash-equivalents.

The investment strategy of the two Australian Ethical Super funds is specified as large stocks for the first, and small stocks for the second of these (Australian Ethical Superannuation, 2001). For the Australian Ethical Super Large fund the disclosed asset allocation implies around 50% exposure to the large and mid-cap factors, 37% to other listed equities (i.e. small and very small stocks) and 8% cash. The estimated factor betas do not correspond to this, and implies that the exposures are fairly evenly distributed between the small, cash and international equity factors. For the Australian Ethical Super Equities fund the disclosed asset allocation implies 21% exposure to the large and mid-cap factors, 62% to other listed equities (i.e. small and very small stocks) and 13% cash. The estimated betas, however, imply just over 10% exposure to the large and mid-cap factors, 34% to the small factor, 41% to cash and 12% to international equities. These figures suggest that, either, these funds

are not meeting their targeted asset allocations, or, the factor proxies are not representative of the funds' holdings in these asset classes.

Summary

The results give no support to the hypothesis that SRI funds differ, in any systematic way, from other funds in terms of exposure to growth or value stocks, for either general or superannuation SRI funds.

The general SRI funds do not provide support for the hypothesis that SRI funds are consistently less exposed to large stocks compared to other funds, and neither do the superannuation SRI funds. The results do, however, provide some support to SRI funds having higher exposures to small stocks. The results also suggest SRI funds have lower exposures, on average, to the mid-cap factor compared to other comparable funds.

No notable differences between the SRI funds and the benchmark indices are found when comparing exposures to the fixed interest factor. The results do suggest SRI funds on average have been more exposed to movements in the cash equivalents market than the relevant benchmark indices indicate. No consistent pattern is found for the SRI fund exposures to the international equity factor.

Model-specific limitations

There are potential problems with the choice of factor proxies. For instance, the proxies for the growth and value factors could be improved by including smaller stocks. Also, the included factors are not strictly exhaustive or mutually exclusive. Fulfilment of these criteria is not necessary, although desirable (Sharpe, 1992). The model does not, for instance, include a factor accounting for international fixed interest, which may be of some relevance, although arguably not of any significant importance.

Furthermore, the varying R-squared values for the estimates indicate that the model possibly could be specified better for some funds with lower R-squared values. For the purposes of this study, however, this is a useful result in itself, as the extent to which the R-squared values for the indices are high relative to the SRI funds suggests that the variability of SRI fund returns is not explained as well by the chosen factor proxies as the variability of the benchmark returns is.

A well specified model requires the independent variables to have reasonably low correlations with each other. Unfortunately, it is inevitable that the factors in a model such as the one used in this study have positive correlations of fairly high magnitudes implying multicollinearity. It seems logical to assume that returns on growth, value, large, small, and international stocks move together to some extent, because their profitability is typically driven by common economic forces.

Calculating the correlations between the individual factors included in the model confirms this assumption. The correlations between the growth, value, medium, small, very small, and international equities indices are high, ranging from 0.599 (between value and small) to 0.874 (between medium and small). This results in major limitations of the model. Whereas the betas for the fixed interest factor and the cash equivalents factor may be reliably interpreted, as they are fairly lowly correlated with the other factors (at the most 0.426 between fixed interest and medium size equities), the betas for the other factors should be interpreted with care [36]. This problem seems inevitable, and at best only accounted for by always acknowledging its presence when interpreting the results.

Buetow et al.(2000) argue that problems can arise from subjectivity in the definitions of investment styles when applying style analysis. Fortunately, this criticism does not apply to the present study to the same extent as it may apply to independent bodies analysing funds that are pre-classified by investment style. This must be so as long as the funds under investigation and their benchmark indices are using the same definitions of styles (as is true for this analysis). The criticism does, however, have one important implication for the present study, and any other study comparing findings from, and assumptions of, investment styles. When making such

comparisons one should always bear in mind how styles are defined by the individual studies. Assertions that findings from one study contradict or correspond with findings of another study should always be made with this in mind. The findings of the style analyses in this study should therefore be interpreted and applied with reference to the definitions given for the factors included in these models.

4.4.2 Style analysis with industry sectors as explanatory variables

Objectives

The objective for this part of the analysis is to investigate whether Australian SRI funds differ from the benchmark indices in exposures to industry sectors.

Anderson (2001) suggests industry sectors can be grouped into five categories by their alignment with sustainability. These categories, and the industry sectors included under each as suggested by Anderson, are reproduced in figure 3.

Industries of the Future	Gatekeepers	Sensitive	Controversial	Unacceptable
Renewable Energy	Banking	Life Sciences	Intensive Agriculture	Alcohol
Education	Finance	Pharma-ceuticals	Forestry	Tobacco
Healthcare	Retail	Construction	Chemicals	Gambling
Information Technology	Leisure	Engineering	Mining	Nuclear
Water & Waste Management	Media	Utilities	Fossil Fuels	Military
	Telecom			Pornography

Figure 3 – Industry sectors grouped by alignment with sustainability

(Source: Anderson, 2001)

[36] A correlation matrix is provided in part 7.3.1 of the appendices.

It is possible to relate this to the ASX industry sectors to a certain degree. This framework can be used to evaluate whether it appears that SRI funds are exhibiting exposures to these categories different to the exposures exhibited by the benchmark indices. Two models are specified, one using only broad industry sectors and one using specific industry sectors.

The choice of which industry sectors to include is limited by the indices available. The two ASX All Resources and All Industrials indices were chosen for a broader break-down of industry sectors. On the other extreme, the 24 ASX specific industry sectors were chosen for a more specific break-down, as these fulfilled the needs for specificity most accurately.

Thus, two different models are specified, one broad model using five factors, and one more specific model using 27 factors in total.

Using broad industry sectors as explanatory variables

Model Specification

The broad model will analyse the sensitivity of returns of funds and indices to the two main sectors in the economy, namely the resources sectors and the industrials sector, as well as returns of fixed interest securities, cash holdings and international equity.

The model was specified similarly to the standard style analysis model, but using two broad industry factors instead of the style factors (i.e. growth, value, medium, small and very small). The model was thus specified as

$$R_i = \beta_{Ri} *(all\ resources) + \beta_{Ii} *(all\ industrials) + \beta_{bi} *(fixed\ interest) + \beta_{ci} *(cash\ equivalents) + \beta_{wi} *(int'l\ equity)\ \varepsilon_i \quad (9)$$

where R_i = return on fund i;

β_{Ri} = fund i's sensitivity to returns on resources stocks;

β_{Ii} = fund i's sensitivity to returns on industrials stocks;

β_{bi} = fund i's sensitivity to returns on fixed interest securities;

β_{ci} = fund i's sensitivity to returns on cash-equivalents;

β_{wi} = fund i's sensitivity to returns on international equity;

ε_i = random error term.

The proxies for fixed interest, cash equivalents and international equity remain the same as in the original style analysis. The make-up of the two ASX broad industry sector indices included are displayed in Table 9 [37].

Table 8 indicates that the overwhelming majority of the total market capitalisation and number of companies included in the All Ordinaries is grouped in the All Industrial Index.

The results from the analysis are displayed in Table 10.

Table 9 – Broad Industry Sectors: Market Capitalisation from 1998-2000

	% of All Ords		
	Aug 1998	Aug 1999	June 2000
ASX All Resources	17.44	16.87	14.08
ASX All Industrials	82.56	83.11	85.92

(Source: ASX Monthly Index Analysis, August 1998; August 1999; June 2000)

[37] Ideally figures from August 2000 should be included instead of figures from June 2000, but as explained earlier, this data is not made available. This does not pose a problem as the purpose of displaying these figures is to provide an indication of how these proportions have changed over the sample period.

Table 10 – Style analysis: Broad industry sectors

fund	*All Resour.*	*All Industr.*	*Fixed Interest*	*Cash Equiv.*	*Int'l Equity*	R^2
MAETG						
Jun92-Aug01	0.1464	0.6688	0.0544	0.1048	0.0257	0.9100
Aug98-Aug01	0.1027	0.7344	0.0885	0.0690	0.0054	0.8946
Aug99-Aug01	0.1618	0.6816	0.1566	0	0	0.9201
Challenger SRI fund						
Jun92-Aug01	.0145	.2270	0	1184	.0749	.1320
Aug98-Aug01	.0456	.2594	.1767	0	0	0
Aug99-Aug01	.1235	.2903	.1746	0	0	0
Australian Ethical						
Sep94-Aug01	.0042	.0025	.0478	.4785	0	0
Aug98-Aug01	0	.0446	0	.4395	.0318	0
Aug99-Aug01	.0201	.0688	0	.5016	0	0
Tower Eth. Growth						
Dec98-Aug01	.3412	.3697	0	.2741	.0149	0
Tower Ethical NEF						
Dec98-Aug01	.3422	.3709	0	.2807	.0062	0
Glebe Blue Chip						
Jul97-Aug01	.2837	.1480	0	0	.2683	.0383
Aug98-Aug01	.2503	.1778	.2279	0	0	.1359
Aug99-Aug01	.2454	.1172	.2271	0	0	0
Glebe Mid Cap						
Jul97-Aug01	.0846	0	0	.2683	.3264	0
Aug98-Aug01	.0775	0	.2510	.2708	0	0
Aug99-Aug01	0	0	.3046	.3181	0	.0221
MSAEG						
Jun92-Aug01	.2817	.2163	.0350	.0907	.1541	0
Aug98-Aug01	.2694	.2122	.2432	.0428	.0189	0
Aug99-Aug01	.2475	.1945	.2550	.0574	0	0
Tower Sup. Eth.1						
Jan95-Aug01	.1991	.2308	0	.2697	0	0
Aug98-Aug01	.3183	.2854	.0888	.1757	0	.0526
Aug99-Aug01	.1811	.4222	.1819	.1726	0	.0423
Tower Sup. Eth.2						
Jan95-Aug01	.2637	.2286	0	.2876	0	0
Aug98-Aug01	.3195	.2834	.0831	.1777	0	.0495
Aug99-Aug01	.1813	.4227	.1818	.1724	0	.0419
Aust. Eth. Sup. Lrg.						
Dec98-Aug01	0	0	.0476	.3512	0	0
Aust. Eth. Sup. Equit.						
Dec98-Aug01	0	.0078	.1030	.3493	0	0

Analysis of the results

No consistent pattern is found in terms of differences in exposures between the All Resources and All Industrial factors when compared to the benchmark index.

Amongst the general SRI funds, the Challenger SRI fund has lower exposures to both factors, yet the relative weightings between the two are comparable to the benchmark index. This is also the case for the Australian Ethical and Glebe Mid Cap funds. The two Tower Ethical funds have comparatively higher exposures to the All Industrials factor than the exposures indicated by the benchmark index. The Glebe Blue Chip fund, however, has comparatively higher exposures to the All Resources factor than indicated by the benchmark index.

Amongst the superannuation SRI funds, the two Tower Super Ethical funds have lower exposures to the All Resources and higher exposures to the All Industrials factor compared to the benchmark index. The two Australian Ethical Super funds have lower exposures to both factors with weightings between these comparable to the benchmark index.

Using specific industry sectors as explanatory variables

The objective for this section of the analysis is to establish if Australian SRI funds differ from their respective indices in terms of exposures to specific industry sectors.

Model Specification

The specific model will analyse the sensitivity of returns of funds and indices to the more specific sectors in the economy, plus returns on fixed interest securities and cash holdings.

The model is specified by

$$R_i = \beta_{1i}*(industry\ 1) + \beta_{2i}*(industry\ 2) + \ldots + \beta_{24i}*(industry\ 24) + \beta_{bi}*(fixed\ interest) + \beta_{ci}*(cash) + \beta_{wi}*(int'l\ equity) + \varepsilon_i \quad (10)$$

where R_i = return on fund i;

β_{1i} = fund i's sensitivity to returns on industry 1;

β_{2i} = fund i's sensitivity to returns on industry 2;

β_{24i} = fund i's sensitivity to returns on industry 24;

β_{bi} = fund i's sensitivity to returns on fixed interest securities;

β_{ci} = fund i's sensitivity to returns on cash-equivalents;

β_{wi} = fund i's sensitivity to returns on international equity;

ε_i = random error term.

The specific industries from 1 to 24, as well as their proportion of the total market capitalisation and number of included companies, are listed in Table 11. Again, figures later than June 2000 were not made available.

This is a very large number of explanatory variables to include in any model. If a large number of factors causes problems in the interpretation of the results it is possible to collapse some of the factors together, or alternatively to use one as a proxy for other factors. In this case this would have to be done based on the collapsed sectors being related or similar, and this in turn should be reflected in relatively high correlations between the sectors that are being collapsed.

Another possible approach, which may better serve the objective of this analysis, is to group the betas estimated for the sub-indices using Anderson's framework. Of course, the categorisation of specific industries into such groups is highly subjective. Thus, the 24 specific indices are sorted by similar groups according to how they best seemed to fit into Anderson's categories, as shown in figure 4. An extra "miscellaneous" category is included under which the sub-indices

Table 11 – Specific Industry Sectors: Market Capitalisation from 1998-2000

	Aug 1998	Aug 1999	Jun 2000
1. Alcohol & Tobacco	2.15	2.11	1.82
2. Banks & Finance	20.28	20.11	20.43
3. Building Materials	2.84	2.53	1.47
4. Chemicals	0.61	0.43	0.49
5. Developers & Contractors	3.27	3.21	3.14
6. Diversified Industrials	3.11	3.28	2.26
7. Diversified Resources	9.45	9.21	7.90
8. Energy	2.96	2.82	2.73
9. Engineering	0.41	0.23	0.17
10. Food & Household Goods	2.30	1.84	1.26
11. Gold	1.61	1.21	1.05
12. Healthcare & Biotechnology	1.02	1.60	2.14
13. Infrastructure & Utilities	1.57	1.73	1.76
14. Insurance	4.36	5.91	4.10
15. Investment & Financial Serv.	1.43	1.72	2.43
16. Media	11.83	11.22	17.02
17. Miscellaneous Industrials	3.11	1.30	2.18
18. Other Metals	3.42	3.65	2.40
19. Paper & Packaging	1.20	1.20	0.85
20. Property	5.86	5.56	5.17
21. Retail	4.17	4.17	3.55
22. Telecommunications	7.11	10.05	11.61
23. Tourism & Leisure	1.73	1.83	1.56
24. Transport	3.40	3.10	2.52

(Source: ASX Monthly Index Analysis, August 1998; August 1999; June 2000)

that do not fit into any of the other categories are placed. None of the sub-indices appeared to fit under the "Industries of the Future" category, hence this category was omitted.

Analysis of the results

Table 12 displays fund exposures to all 27 factors. Some comments on this table are provided in part 7.2 of the appendices. Table 13 displays fund exposures to the industry categories sorted by their alignment with sustainability. This table is constructed by collapsing the specific industry betas for each category.

Gatekeepers	Sensitive	Controversial	Unacceptable	Miscellaneous
Banks & Finance	Developers & Contractors	Building Materials	Alcohol & Tobacco	Food & Household Goods
Insurance	Engineering	Chemicals	Gold	Miscellaneous Industrials
Investments & Financial Services	Health & Biotechnology	Diversified Resources	Other Metals	Property
Media	Infrastucture & Utilities	Energy		Diversified Industrials
Retail		Paper & Packaging		
Telecom-munication		Transport		
Tourism & Leisure				

Figure 4 – ASX sub-indices grouped by alignment with sustainability as per Anderson's framework

The R-squared values for this model are all high, except for the Challenger SRI fund, whose R-squared values again are below 0.50. Since all the other R-squared values are so high, where some of them have been lower using the previously specified models, this suggests that there is something about this fund that makes its returns variation hard to explain – at least using of the style analysis models specified in this study.

The general SRI funds

The MAETG Index has the highest exposures for the "gatekeepers" factor (which also accounts for 60% of the total market cap) with exposures of around 30%. The exposures to the other categories are fairly evenly distributed, with 7.3% and 5.5% for the "sensitive" factor, 9.6% and 6.2% for the "controversial" factor, 9.6% and 18.2% for the "unacceptable" category and 5.6% and 1.2% for the

Table 12 – Style analysis: Specific industry sectors

		R^2	*Alcohol & Tobacco*	*Banks & Finance*	*Building Materials*	*Chemicals*	*Developers & Contractors*	*Diversified Industrials*	*Diversified Resources*	*Energy*	*Engineering*	*Food & Household Goods*	*Gold*	*Healthcare & Biotechnology*	*Infrastructure & Utilities*
%of All Ords*			0.0182	0.2043	0.0147	0.0049	0.0314	0.0226	0.079	0.0273	0.0017	0.0126	0.0105	0.0214	0.0176
*Annual compounded return***			20.1	14.7	-9.3	-17.5	12.9	-10.2	1.1	-8.8	-16.3	-23.2	-21.8	9.1	10.2
MAETG	Jun92-Aug01	0.8123	0.0704	*0.1863*	0.0198	0	0	0.0230	0.0259	0.0348	0.0219	0.0215	0.0257	0.0398	0.0114
	Aug98-Aug01	0.8399	0.1190	0.1723	0	0	0	0	0.0172	0.0446	0.0289	0	0.0627	0.0260	0
Challenger	Jun92-Aug01	0.4785	0	0.1577	0.0278	0	0	0.0984	0	0.0203	0.0442	0.0335	0.0134	0	0
	Aug98-Aug01	0.3763	0	0.1076	0.0035	0	0	0.1257	0	0.0436	0.0522	0	0.0770	0	0
Aus. Ethical	Sep94-Aug01	0.6506	0	0.0733	0.0225	0	0.0329	0	0.0271	0	0	0.0220	0	0.1264	0.1228
	Aug98-Aug01	0.7057	0	0.0256	0	0	0.1490	0	0.0777	0	0	0.0319	0.0676	0.0801	0
Tower Eth. Gr.	Dec98-Aug01	0.7541	0.0373	0.2337	0	0	0	0	0.0245	0	0	0	0	0.1939	0
Tower Eth. N..	Dec98-Aug01	0.7519	0.0390	0.2251	0	0	0	0	0.0224	0	0	0	0	0.1880	0
Glebe B. Chip	Jul97-Aug01	0.8243	0	0.1653	0	0	0	0.0289	0.0920	0.0273	0.0061	0.0654	0	0.0434	0.0301
	Aug98-Aug01	0.8722	0	0.1295	0	0	0	0	0.1056	0.0628	0.0697	0.0288	0.0248	0.0282	0
Glebe M. Cap	Jul97-Aug01	0.7191	0	0	0	0	0	0	0.0960	0	0	0.0190	0	0.1040	0.2391
	Aug98-Aug01	0.8221	0.0620	0	0	0	0	0	0.0543	0	0.0251	0	0	0.1182	0.2517
MSAEG	Jun92-Aug01	0.8499	0.0634	0.1170	0.0411	0	0	0	0.0799	0.0353	0.0198	0.0283	0.0305	0.0204	0.0014
	Aug98-Aug01	0.8970	0.0518	0.1120	0	0	0.0041	0	0.0793	0.0395	0.0195	0	0.0712	0.0226	0
Tower S. Eth.1	Jan94-Aug01	0.6783	0.1537	0.1144	0.0201	0	0	0	0	0.0433	0	0	0.0332	0.1012	0
	Aug98-Aug01	0.7240	0.1097	0.1153	0	0	0	0	0	0.0404	0	0	0.0696	0.0866	0
Tower S. Eth. 2	Jan94-Aug01	0.6867	0.1345	0.1098	0.0207	0	0	0	0	0.0449	0.0044	0	0.0355	0.0926	0
	Aug98-Aug01	0.7193	0.1081	0.1131	0	0	0	0	0	0.0336	0	0	0.0714	0.0904	0
Aust. Eth. S. L.	Dec98-Aug01	0.8519	0	0	0	0.0333	0	0	0	0	0.1351	0	0.0732	0.0590	0
Aust. Eth. S. E.	Dec98-Aug01	0.7071	0	0.0058	0	0	0.1759	0	0.0209	0	0.1584	0	0.0152	0.0016	0

* Figures from the ASX Monthly Index Analysis (June 2000 p 22). ** Figures from the ASX Monthly Index Analysis (June 2000 p 45), over the last 3 years, given in %.

Table 12 (Cont.)

		Insurance	Invest-ment & Financial Services	Media	Miscel-laneous Indust-rials	Other Metals	Paper & Pac-kaging	Property	Retail	Tele-commun-ications	Tourism & Leisure	Transport	Fixed Interest	Cash Equiv.	Int'l equity
*%of All Ords**		0.0410	0.0410	0.0243	0.1702	0.0218	0.0240	0.0085	0.0517	0.0355	0.1161	0.0156	0.0252		
*Annual compounded return***		2.1	0.4	41.8	14.0	-6.9	-15.5	0.9	5.9	20.2	-3.7	16.1			
MAETG	Jun92-Aug01	0	0.0318	0.0665	0.0112	0	0	0	0.0183	0.0007	0	0.0156	0.1677	0	*0.2076*
	Aug98-Aug01	0	0	0.0907	0.0118	0	0	0	0.0333	0	0	0	0.2018	0	0.1919
Challenger	Jun92-Aug01	0	0	0.0162	0	0	0	0	0	0	0	0.0363	0.2438	0.3010	0.0074
	Aug98-Aug01	0	0	0.0111	0	0	0	0	0	0	0	0.0485	0.1680	0.3627	0
Aus. Ethical	Sep94-Aug01	0	0.0382	0.0467	0.0501	0.0297	0	0	0	0.1004	0	0.0224	0	0.2854	0
	Aug98-Aug01	0	0.0040	0.0320	0.0500	0.0614	0	0	0	0.0918	0	0.0059	0	0.3231	0
Tower Eth. Gr.	Dec98-Aug01	0	0	0.1695	0	0	0	0	0	0	0	0	0.2109	0	0.1302
Tower Eth. N..	Dec98-Aug01	0	0	0.1700	0	0	0	0	0	0	0	0	0.2156	0	0.1399
Glebe B. Chip	Jul97-Aug01	0	0	0.0097	0	0	0	0.0055	0.0295	0	0	0.0380	0.2326	0	0.2262
	Aug98-Aug01	0	0	0.0047	0	0	0	0	0.0459	0	0	0.0378	0.2705	0	0.1916
Glebe M. Cap	Jul97-Aug01	0	0.0646	0.0400	0.0469	0	0	0	0.0749	0.0661	0	0.0181	0	0.0609	0.1704
	Aug98-Aug01	0	0	0.0862	0.0467	0	0	0	0.0785	0.0410	0	0	0.0099	0	0.2265
MSAEG	Jun92-Aug01	0	0.0501	0.0569	0.0121	0	0	0	0.0285	0	0	0.0120	0.2235	0	*0.1799*
	Aug98-Aug01	0	0	0.0654	0.0218	0	0	0	0.0504	0	0	0.0067	0.3040	0	0.1516
Tower S. Eth.1	Jan94-Aug01	0	0	0.0889	0.0190	0.0041	0	0	0	0	0	0	0.2178	0	0.2043
	Aug98-Aug01	0	0	0.1115	0	0	0	0	0.0016	0	0	0	0.2706	0	0.1948
Tower S. Eth. 2	Jan94-Aug01	0	0	0.0875	0.0188	0.0143	0	0	0	0	0	0	0.2507	0	0.1862
	Aug98-Aug01	0	0	0.1120	0	0	0	0	0.0055	0	0	0	0.2765	0	0.1892
Aust. Eth. S. L.	Dec98-Aug01	0	0	0	0.0756	0.0072	0	0	0	0.0718	0.0410	0.1212	0	0.2406	0.1419
Aust. Eth. S. E.	Dec98-Aug01	0	0	0.0220	0.0506	0.0621	0	0	0	0.0680	0	0.0152	0.0728	0.3313	0

* Figures from the ASX Monthly Index Analysis (June 2000 p 22). ** Figures from the ASX Monthly Index Analysis (June 2000 p 45), over the last 3 years, given in %.

Table 13 – Style analysis: Self-constructed industry grouping by alignment with sustainability

	Gate-keepers	*Sensitive*	*Contro-versial*	*Unaccep-table*	*Miscel-laneous*	*Fixed Interest*	*Cash Equiv.*	*Int'l equity*
*% of All Ords**	60.7	7.21	15.96	5.27	10.87			
*Average Annual Comp. Return***	11.63	3.98	-5.65	-2.87	-18.50			
MAETG								
Jun92-Aug01	.3037	.0732	.0961	.0960	.0557	.1677	0	.2076
Aug98-Aug01	.2962	.0549	.0618	.1817	.0118	.2018	0	.1919
Challenger SRI fund								
Jun92-Aug01	.1739	.0442	.0844	.0134	.1319	.2438	.3010	.0074
Aug98-Aug01	.1187	.0522	.0957	.0770	.1257	.1680	.3627	0
Australian Ethical								
Sep94-Aug01	.2586	.2822	.0720	.0297	.0721	0	.2854	0
Aug98-Aug01	.1533	.2291	.0837	.1290	.0819	0	.3231	0
Tower Ethical Growth								
Dec98-Aug01	.4032	.1939	.0245	.0373	0	.2109	0	.1302
Tower Ethical NEF								
Dec98-Aug01	.3951	.1880	.0224	.0390	0	.2156	0	.1399
Glebe Blue Chip								
Jul97-Aug01	.2045	.0796	.1573	0	.0998	.2326	0	.2262
Aug98-Aug01	.1801	.0979	.2063	.0248	.0288	.2705	0	.1916
Glebe Mid Cap								
Jul97-Aug01	.2455	.3432	.1141	0	.0659	0	.0609	.1704
Aug98-Aug01	.2056	.3950	.0543	.0620	.0467	.0099	0	.2265
Super Aust. Equity							0	
Jun92-Aug01	.2524	.0416	.1683	.0939	.0404	.2235		.1799
Aug98-Aug01	.2278	.0463	.1255	.1230	.0218	.3040	0	.1516
Tower Super Ethical Gr. 1							0	
Jan95-Aug01	.2033	.1012	.0634	.1911	.0190	.2178		.2043
Aug98-Aug01	.2284	.0866	.0404	.1792	0	.2706	0	.1948
Tower Super Ethical Gr. 2								
Jan95-Aug01	.1973	.0970	.0656	.1843	.0188	.2507	0	.1862
Aug98-Aug01	.2306	.0904	.0336	.1795	0	.2765	0	.1892
Aust. Eth. Super Large								
Dec98-Aug01	.1128	.1941	.1545	.0804	.0756	0	.2406	.1419
Aust. Eth. Super Equit.								
Dec98-Aug01	.0958	.3359	.0361	.0774	.0506	.0728	.3313	0

* These percentages are calculated by adding up the percentages of the total market capitalisation of the individual industries using figures from the ASX Montly Index Analysis (June 2000, p. 22).

** These are averages of the individual industries' annual compounded returns over the last 3 years (as of June 2000) based on equal holdings in the included industries using figures from the ASX Montly Index Analysis (June 2000, p. 45).

"miscellaneous" category, for the full period and the last 3-year period, respectively [38].

The Challenger SRI, Australian Ethical and Glebe Blue Chip funds have moderately lower, the Glebe Mid Cap fund has slightly lower and the two Tower Ethical funds have moderately higher exposures to the "gatekeepers" factors compared to the benchmark index.

The Australian Ethical, Glebe Mid Cap and the two Tower Ethical funds have very much higher and the Challenger SRI and Glebe Blue Chip funds have similar exposures to the "sensitive" factor compared to the benchmark index. Given this category's low market cap coverage, reflected in the benchmark index, four of the general SRI funds seem to be markedly over-exposed to this category, with exposures of up to 39%.

The Glebe Blue Chip fund has slightly higher, the two Tower Ethical funds have slightly lower and the Australian Ethical and Glebe Mid Cap funds have similar exposures to the "controversial" factor compared to the benchmark index.

All of the general SRI funds seem to be slightly less exposed to the "unacceptable" factor compared to the benchmark index, as would be expected as SRI funds typically screen out these stocks.

Lastly, the Challenger SRI and Australian Ethical funds have slightly higher, the two Tower Ethical funds have lower and the two Glebe funds have similar exposures to the "miscellaneous" category.

The superannuation SRI funds

The MSAEG Index have similar exposures to the factors as does the MAETG Index, except for slightly lower exposures to the "gatekeepers" factor, seemingly compensated for by slightly higher exposures to the "controversial" factor. The two

[38] Estimates cannot be obtained for periods less than 3 years because the number of explanatory variables exceeds the number of observations.

Australian Ethical Super funds have lower and the two Tower Super Ethical funds have similar exposures to the "gatekeepers" factor compared to the benchmark index.

The two Tower Super Ethical funds have moderately lower and the two Australian Equity Super funds have very much higher exposures to the "sensitive" factor. This corresponds to the findings for the general SRI funds. The Australian Ethical Super Equities and the two Tower Super Ethical funds have markedly lower and the Australian Ethical Super Large fund has similar exposure to the "controversial" factor.

Interestingly, the two Tower Super Ethical Super funds have markedly higher exposures to the "unacceptable" factor compared to the industry benchmark (the two Australian Ethical Super funds have slightly lower exposures to this factor). The two Tower Super Ethical funds have slightly lower, the Australian Ethical Super Large fund has slightly higher and the Australian Ethical Super Equities fund has similar exposures to the "miscellaneous" factor.

Summary

Notable differences in factor exposures between the SRI funds and their benchmark indices includes a tendency to higher exposures to the "sensitive" factor for both general and superannuation SRI funds. It seems these higher exposures are compensated for by lower exposures to the "unacceptable" factor for the general SRI funds and lower exposures to the "controversial" factor for the superannuation SRI funds.

Model-specific limitations

The most prominent limitation of this analysis is the large likelihood of multicollinearity due to the large number of explanatory variables, even if correlation coefficients between the variables in this case are less correlated with each other

compared to the style analysis by asset class model [39]. The more variables included the higher are the chances of several variables tending to move together.

Further work could focus on determining a more suitable level of industry specificity, where the number of industries are reduced but still representative of the total market. Of course, if the broader category break-down is based on how the industries conceptually fit together, and the individual groups are diversified comparably to the full market, in terms of covariance of returns, then the covariance of the group returns is likely to still be high. The problem of multicollinearity in this type of style analysis can only really be solved if industries are sorted by their covariance – and the groupings of the industries by this measure may well not make any sense conceptually.

[39] Whereas the correlations between asset-class variables were up to 87% (between small and medium capitalisation) the highest correlation amongst the industry variable is 70% (between the miscellaneous industrials industry and the investment and finance industry), and most correlations are under 50%. The betas are still biased because of the constraints placed on the regression and not as reliable for interpretation as they would be under an unconstrained regression, even if the R-squared values are high.

5. CONCLUSION

The SRI industry has experienced exceptional growth and developments over the last decades. This is especially evident in the U.S., U.K. and European markets, where SRIs have evolved from being a niche activity to becoming mainstream. Although the Australian SRI industry has not reached this same level of maturity yet there is reason to expect strong growth in the near future. Although the SRI industry has reached maturity in some markets the evolution of a theoretical framework and empirical evidence on how SRIs behave as financial assets is yet in an early stage of development. Although assumptions and hypotheses are plentiful the literature lacks important evidence of how SRIs behave as financial assets. Such information is important for how these investments, and especially investment funds, are marketed and perceived by the industry and the public.

The present study has investigated Australian general and superannuation SRI funds over a total time period from June 1992 to August 2001, and compared these to benchmark indices for the general and the superannuation funds, in order provide evidence of how SRI funds behave as financial assets, and in particular whether they behave differently to comparable non-SRI funds. Thus, three hypotheses were to be tested in this study. Hypothesis one ($H_0 1$) asserts that raw returns and variances are the same for SRI funds as for comparable non-SRI funds, the second hypothesis ($H_0 2$) asserts that risk-adjusted performance is the same for SRI funds as for comparable non-SRI funds, and the third hypothesis ($H_0 3$)asserts that exposures to asset classes and investment styles are consistent with the benchmark indices.

The literature presents two opposing hypotheses in regard to whether SRIs are likely to perform better or worse than non-SRIs. The "green dividend" hypothesis holds that SRIs should perform better, whereas the "green penalty" hypothesis holds that they should perform worse. The first two hypotheses to be tested in the present study hold that SRI funds do not perform differently to comparable non-SRI fund benchmarks.

The preliminary observations of the fund returns do not allow the acceptance of hypothesis H_01. The general and superannuation SRI funds' raw returns are different from those of the respective benchmark indices, although not in any consistent direction. This result is not of any great importance as raw returns do not provide reliable performance measures.

Jensen alphas were calculated using risk-adjusted returns whilst controlling for the market, size, style (growth versus value), and fixed interest factors. The calculated fund alphas were compared to the relevant benchmark alphas in order to test hypothesis H_02. For the general SRI funds, the results support this hypothesis only over the August 1999-August 2001 period, where both the benchmark and the fund alphas were consistently insignificantly different from zero. The general fund benchmark index alphas were positive and significant for the June 1992-August 2001 and the August 1998-August 2001 periods, whereas none of the fund alphas were significantly different from zero. This implies that the SRI funds have performed differently over these time periods, but not over the last 2 years. Significant benchmark alphas were found only when using the small (as opposed to the very small) stock proxy in the size factor, implying that these findings are sensitive to the choice of proxy for small stocks.

For the superannuation SRI funds, the results support hypothesis H_02 for the June 1992-August 2001 and the August 1998-August 2001, where the fund and benchmark alphas were insignificantly different from zero, but not for the August 1998-August 2001 period, where the fund alphas are insignificantly different from zero and the benchmark alpha is positive and significant. This implies that the superannuation SRI funds have performed differently to the benchmark over the last 2-year period, but not over the full and the 2-year periods. Again, the significant benchmark alpha was found when using the small stock proxy in the size factor.

The fact that the alphas calculated using the very small stock proxy in the size factor are consistently insignificantly different from zero suggest that H_02 holds for all funds over all periods when this proxy is used, but not when the small stock proxy is used. The evidence supporting H_02 is therefore sensitive to the choice of proxy as well as the time-period over which the funds are evaluated.

The style analysis, employed in order to test hypothesis H_03, presents important evidence to the SRI debate. SRI funds have been assumed to be more heavily weighted in growth rather than value stocks, compared to non-SRI funds. The results from the style analysis do not support this assumption. The SRI fund exposures to the growth and value factors are consistent with the benchmark exposures, and hypothesis H_03 holds in this context. It has also been assumed that SRI funds are more heavily weighted in small rather than large stocks, which is mildly supported by the results, and the evidence to support hypothesis H_03 is weak in this context. Fund exposures to the fixed interest securities and international stocks were not different compared to the benchmarks, but the SRI funds tended to have higher exposures to cash equivalents.

The style analysis examining fund exposures across industry sectors reveals one note-worthy difference between SRI funds and the benchmark indices. The SRI funds have larger exposures to the "sensitive" industry category, suggesting SRI funds' positive screens tend to include such stocks. These over-exposures seemed to a certain extent to be compensated for by slightly smaller exposures to the "unacceptable" industry category in the case of the general SRI funds, suggesting these funds' negative screens tend to exclude such stocks. The superannuation SRI funds have slightly smaller exposures to the "controversial" industry category, suggesting these funds' negative screens tend to exclude these stocks.

Thus, the hypothesis asserting that factor exposures are consistent with the benchmark indices can not be accepted as it stands. It is important to appreciate, however, that SRI funds do not have strong consistent patterns in terms of style, but vary amongst themselves in factor exposures. They do not represent a homogenous category of investments, and they do not belong in an investment class of their own. The individual funds are very different amongst themselves, rather than consistently different to the benchmark indices, implying these funds should be evaluated on an individual basis as they seem to have individual style characteristics.

The inconsistencies in factor exposures across the individual SRI funds give rise to the question of whether individual non-SRI funds have similar inconsistencies

in factor exposures. Further analysis would be assisted though a survey of non-SRI funds on an individual basis, over the same category. If these funds show more consistent patterns of factor exposures than do SRI funds, this may indicate that SRI funds are more inconsistent in their exposures than non-SRI funds.

The most important implication of this study is arguably that the SRI-tag does not guarantee any specific asset-class or industry exposure. When evaluating these funds as financial assets they must be evaluated as any other fund and no pre-determined assumptions should be made. SRI fund members should not automatically expect their funds to over or under-perform compared to non-SRI funds, nor should they automatically expect their funds to have certain style characteristics.

6. REFERENCES

Anderson, Michael (2001). *Sustainable Future Funds – Riding the long wave of sustainability*. Presentation given at 2001 Ethical Investment Association Conference, Melbourne, Australia.

Anderson, Michaela (2000). *Development of ASFA policy on "ethical investment"*. Available WWW: http://www.superannuation.asfa.au/members/rpm.cfm [2001, June 19].

Angel, J.J. and Rivoli, P. (1997). Does ethical investing impose a cost upon the firm? A theoretical perspective. *The Journal of Investing*, *6* (4), pp. 57-61.

ASX Monthly Index Analysis. (2000, June). Issue 244. ASX Operations Pty Ltd.

Australian Ethical Superannuation (2001, November). Australian Ethical Superannuation Pty Ltd.

Beal, D. And Goyen, M. (1998). Putting your money where your mouth is – A profile of ethical investors. *Financial Services Review 7* (2), pp. 129-143.

Birkensleigh, S., Proske, C., Kazakoff, E. and Kendrick, J. (2000). *The role of Australia's financial sector in sustainability.* PriceWaterhouseCoopers.

Bodie, Z., Kane, A. and Marcus, A. (1999). *Investments*, 4th edition. Irwin McGraw-Hill.

Buetow, G.W., Johnson, R.R. and Runkle, D.E. (2000, Spring). The inconsistency of return-based style analysis. *The Journal of Portfolio Management*, *26* (4), pp. 61-77.

Clark-Murphy, M. (2000). *The attributes of shares: What do investors value and what do their advisors believe they will value?* Unpublished doctoral dissertation, Unversity of Western Australia.

Cummings, L.S. (2000). The financial performance of ethical investment trusts: An Australian perspective. *Journal of Business Ethics*, *25* (1), pp. 79-92.

Drew, M.E. and Stanford, J. (2001, March). Asset selection and superannuation fund performance: A note for trustees. *Economic Papers, Economic Society of Australia*, *20* (1), pp. 57-65.

Ellman, E. (1997). *What Is Ethical Investment?* Available WWW: http://www.ethicalinvestment.org [2001, 12 October].

Ethical Investor (2001, September). Issue 4.

Eviews 4 User's Guide (1994). Quantitative Micro Software.

Feldman, S.J., Soyka, P.A. and Ameer, P.G. (1997). Does improving a firm's environmental management system and environmental performance result in a higher stock price? *Journal of Investing*, *6* (4), pp. 87-97.

Frino, A. and Gallagher, D.R. (1999, December). *Is index performance achievable?: An analysis of Australian equity index funds.* Unpublished manuscript, Department of Finance, University of Sydney, NSW 2006, Australia.

FTSE4Good (2001, July). *Socially Responsible Investments.* Available WWW: http://www.ftse4good.com/frm_mediap2.asp.

Gottsman, L. and Kessler, J. (1998). Smart screened investments: environmentally screened equity funds that perform like conventional funds. *The Journal of Investing*, *7* (3), pp. 15-24.

Groenewoller, P.L., McLeod, J. and Rose, L.C. (2001, June). Style analysis: Is it useful in analysing New Zealand managed trusts? *Pacific Accounting Review*, *13* (1), pp.1-17.

Guerard, J.B. (1997). Additional evidence on the cost of being socially responsible in investing. *The Journal of Investing*, *6* (4), pp. 31-35.

Indro, D.C., Jiang, C.X., Hu, M.Y, and Lee, W.Y. (1998). Mutual fund performance: A question of style. *The Journal of Investing*, *7* (2), pp. 46-53.

Kahn, R.N., Lekander, C. and Leimkuhler, T. (1997). Just say no? The investment implications of tobacco divestiture. *The Journal of Investing*, *6* (4), pp. 62-70.

Kinder, P.D. and Domini, A.L. (1997). Social screening: Paradigms old and new. *The Journal of Investing*, *6* (4), pp. 12-16.

Krumsiek, B.J. (1997). The emergence of a new era in mutual fund investing: Socially responsible investing comes of age. *The Journal of Investing*, *6* (4), pp. 25-30.

Kurtz, L. (1997). No effect, or no net effect? Studies on socially responsible investing. *The Journal of Investing*, *6* (4), pp. 37-49.

Liondis, G. (2001, August 2). Coming soon: flood of new SRI offerings. *Money management* [On-line]. Available WWW: http://www.moneymanagement.com.au/articles/01/0c006201.asp.

Lobosco, A. (1999). Style/risk-adjusted performance. *The Journal of Portfolio Management*, *25* (3), pp. 65-68.

Lucas, L. and Riepe, M.W. (1996). *The role of returns-based style analysis: Understanding, implementing, and interpreting the technique.* Unpublished

manuscript, Ibbotson Associates, Inc., 225 North Michigan Avenue, Suite 700, Chicago, IL 60601-7676, USA.

Managed Investment Fact Profiles (2001). Morningstar Research Pty Ltd.

Markowitz, H.M. (1958). *Portfolio selection.* New Haven and London, Yale University Press.

Markowitz, H.M. (1976). Markowitz revisited. *Financial Analysts Journal, 32* (5), pp. 47-52.

McGuire, J.B., Sundgren, A. and Schneeweis, T. (1998). Corporate social responsibility and firm financial performance. *Academy of Management Journal, 31* (4), pp. 854-872.

Merton, R. (1987). A simple model of capital market equilibrium with incomplete information. *Journal of Finance, 42* (3), pp. 483-510.

Morningstar Performance Calculation Methodology - Technical Bulletin (n.d.). Morningstar.

Moskowitz, M. (1997). Social investing: The moral foundation. *The Journal of Investing, 6* (4), pp. 9-11.

MSCI Methodology Book (2001, May). Available WWW: http://www.msci.com.

Olsen, R.A. (1998). Behavioural finance and its implications for stock-price volatility. *Financial Analysts Journal, 54* (2), pp. 10-18.

Papmehl, A. (2001, June). Do good and prosper. *CMA Management, 75* (4), pp. 44-45.

Payne, B. (2001, April 30). 'Engagement' picked over screens. *Pensions & Investments, 29* (9), pp. 14,18.

Performance or Principles? Tower Managed Funds (2001). Available WWW: http://www.towerfin.com [2001, November 4].

Performance tables by Corporate Monitor. (2001, September). Published in *Ethical Investor*, Issue 4, pp. 51-62.

Pindyck, R.S. and Rubinfeld, D.L. (1999). *Econometric models and economic forecasts*, 4th edition. McGraw-Hill.

Roll, R. (1992, Summer). A Mean/Variance Analysis of Tracking Error. *The Journal of Portfolio Management, 18* (4), pp. 13-22.

Saleeba, J. and Proske, C. (2000). *Superannuation Members Perspective on Environmentally Screened Funds.* Unpulished manuscript, Monash University,

Australia.

Shapiro, J. (1992). The movement since 1970. In Kinder, P.D., Lydenberg, S.D. and Domini, A.L. (Eds.), *The Social Investment Almanac* (Chapter 2, pp. 8-23). Henry Holt and Company, New York.

Sharpe, W.F. (1992). Asset Allocation: Management style and performance measurement. *The Journal of Portfolio Management, 18* (2), pp.7-19.

Socially Responsible Investment (n.d.). FTSE4Good. Available WWW: http://www.ftse4Good.com [2001, July 15].

Socially Responsible Investment in Australia. (2000). The Allen Consulting Group.

Studenmund, A.H. (2001). *Using Econometrics*, 4th edition.Addison Wesley Longman, Inc.

Teper, J.A. (1992). Evaluating the cost of socially responsible investing. In Kinder, P.D., Lydenberg, S.D. and Domini, A.L. (Eds.), *The Social Investment Almanac* (Chapter 28, pp. 340-249). Henry Holt and Company, New York.

The Allen Group (2000). *Socially responsible investment in Australia.* The Allen Consulting Group Pty Ltd.

The Ethical Investment Association Newsletter (2001). Available WWW: http://www.eia.au [2001, November 19].

Tippet, J. (2001). Performance of Australia's ethical funds. *The Australian Economic Review, 34* (2), pp. 170-178.

Tower Managed Funds (2001). *Performance or Principles*? Available WWW: http://www.towerfin.com [2001, November 4].

Tower Managed Funds Australia (2001). *Investments - Asset Allocations.* Available WWW: http://www.toweraustralia.com.au [2001, November 4].

United Nations Sustainable Development - About commission on sustainable development (1999). Available WWW: http://www.un.org/esa/sustdev/csdgen.htm [2001, October 20].

Waddock, S. and Graves, B. (1997). Finding the link between Stakeholder Relations and Quality of Management. *The Journal of Investing, 6* (4), pp. 20-24.

Waddock, S. and Graves, B. (2000). Performance characteristics of social and traditional investments. *Journal of Investing, 9* (2), pp. 27-46.

Wade, F. (2001, October 22). Less than three in ten shareholders say profits are top priority for a company. *Ethical Investor*, available WWW:

http://www.ethicalinvestor.com.au.

Wollenberg, Y.C. (2001, March 19). Investing with your conscience doesn't preclude big returns. *Medical Economics*, *78* (6), p. 18.

7. APPENDICES

7.1 Data used for constructing the very small ordinaries index

Table I

Date	The proportion of the S&P/ASX 300 out of the ASX All Ordinaries
31 Dec 1992	92.46
31 Dec 1993	93.15
31 Dec 1994	92.50
31 Dec 1995	92.64
31 Dec 1996	93.74
31 Dec 1997	94.91
31 Dec 1998	96.06
31 Dec 1999	95.21

Source: Webb (Standard & Poors, personal communication, 6 November 2001).

7.2 More observations from the full specific industry table

Table 12 includes 27 betas. Because of the large number of estimated betas these are difficult to interpret individually. Some comments can be made, however, on individual exposures, or apparent exposure patterns, to the specific industry factors.

The two Tower Super Ethical funds give betas of twice the magnitude of the index betas for the alcohol and tobacco industry. This is very strange, since most SRI funds would exclude all included companies. The general funds do, however, give betas consistently lower than the index. Exposures to the banks and finance industry are consistently very similar to that of the indices. The Australian Ethical fund and the Australian Ethical Super Large fund betas for the developers and contractors industry (in the last 3-year period) stand out as being very high compared to betas of zero for the indices. The Challenger fund betas for the diversified industrials industry stand out as quite large compared to betas of zero or at best very low values for the other funds and indices. All of the general SRI funds, except for the Challenger SRI fund, have consistently larger betas for the diversified resources industry. The

superannuation SRI funds indicate an opposite pattern, with betas of mostly zero where the index gives betas of around 8% (except for the Australian Ethical Super Equities fund which has slightly higher betas). The two Australian Ethical Super funds have comparatively high betas for the engineering industry, for which the index and the other funds have very low betas.

A large proportion of the funds, both general and superannuation, have consistently higher betas for the healthcare and biotechnology industry. To the extent that these results are reliable this may indicate positive screening in this area. The Glebe Mid Cap fund has very high betas for the infrastructure and utilities industry, for which most of the other funds and indices have zero-value or very small betas. The two Tower Ethical funds have higher betas for the media industry than do the other funds and indices. Australian Ethical fund, the Australian Ethical Super Equities fund and the second of the Tower Super funds have high betas for the other metals industry, for which the other fund and index betas are zero or very low. The Glebe Mid Cap fund has comparatively higher betas for the retail industry.

The Australian Ethical fund, the Glebe Mid Cap fund and the two Australian Ethical Super funds all have relatively high betas where the betas for all the other fund and indices are zero (or as good as). The Glebe Mid Cap fund and the Australian Ethical Super Large fund have higher betas than the others for the transport industry.

7.3 Correlation Matrices

7.3.1 Bilateral correlations between variables in the style analysis

Table 11

	Growth	*Value*	*medium*	*small*	*very small*	*fixed int.*	*cash*	*world*
growth	1.0000	0.6897	0.7178	0.6682	0.6848	0.3017	0.0329	0.5700
value	0.6897	1.0000	0.6399	0.5991	0.7574	0.3400	-0.0903	0.6065
medium	0.7178	0.6399	1.0000	0.8737	0.7022	0.4258	-0.0191	0.5346
small	0.6682	0.5991	0.8737	1.0000	0.6679	0.3025	0.0006	0.5850
very small	0.6848	0.7574	0.7022	0.6679	1.0000	0.3002	0.0137	0.5883
fixed int.	0.3017	0.3400	0.4258	0.3025	0.3002	1.0000	0.2600	0.1864
cash	0.0329	-0.0903	-0.0191	0.0006	0.0137	0.2600	1.0000	-0.0697
world	0.5700	0.6065	0.5346	0.5850	0.5883	0.1864	-0.0697	1.0000

7.3.2 Bilateral correlations between the variables in the style by broad industries analysis

Table III

	All Ind.	*All Res.*	*fixed int.*	*cash*	*world*
All Ind.	1.0000	0.4942	0.4102	-0.0149	0.6890
All Res.	0.4942	1.0000	0.1897	-0.0642	0.4563
fixed int.	0.4102	0.1897	1.0000	0.2600	0.1864
cash	-0.0149	-0.0642	0.2600	1.0000	-0.0697
world	0.6890	0.4563	0.1864	-0.0697	1.0000

7.3.3 Bilateral correlations between the variables in the style by specific industries analysis (Table IV)

	Alcohol & Tobacco	*Banks & Finance*	*Building Materials*	*Chemicals*	*Dev. & Contr.*	*Diversified Industrials*	*Diversified Resources*	*Energy*	*Engin-eering*	*Food & H/H Goods*	*Gold*	*Healthcare & Biot.*
Alcohol & Tobacco	1.0000	0.4811	0.3265	0.2873	0.4578	0.3495	0.1439	0.1628	0.3386	0.3191	0.1981	0.3044
Banks & Finance	0.4811	1.0000	0.4017	0.3715	0.5204	0.5060	0.3407	0.3202	0.4295	0.3716	0.2379	0.4635
Building Materials	0.3265	0.4017	1.0000	0.4770	0.3346	0.5840	0.3196	0.3225	0.5016	0.3974	0.2137	0.3563
Chemicals	0.2873	0.3715	0.4770	1.0000	0.4286	0.6028	0.2717	0.3198	0.4722	0.3981	0.3917	0.2461
Dev. & Contractors	0.4578	0.5204	0.3346	0.4286	1.0000	0.3762	0.2826	0.2546	0.3430	0.4280	0.1856	0.5997
Div. Industrials	0.3495	0.5060	0.5840	0.6028	0.3762	1.0000	0.3920	0.4645	0.5650	0.3675	0.3061	0.2686
Div.Resources	0.1439	0.3407	0.3196	0.2717	0.2826	0.3920	1.0000	0.4169	0.2234	0.2518	0.2329	0.3046
Energy	0.1628	0.3202	0.3225	0.3198	0.2546	0.4645	0.4169	1.0000	0.2808	0.3384	0.2491	0.2637
Engineering	0.3386	0.4295	0.5016	0.4722	0.3430	0.5650	0.2234	0.2808	1.0000	0.3674	0.3504	0.4302
Food & H/HGoods	0.3191	0.3716	0.3974	0.3981	0.4280	0.3675	0.2518	0.3384	0.3674	1.0000	0.2163	0.4249
Gold	0.1981	0.2379	0.2137	0.3917	0.1856	0.3061	0.2329	0.2491	0.3504	0.2163	1.0000	0.1868
Healthc. & Biot.	0.3044	0.4635	0.3563	0.2461	0.5997	0.2686	0.3046	0.2637	0.4302	0.4249	0.1868	1.0000
Infrastr. & Utilities	0.4823	0.3298	0.2068	0.2867	0.5099	0.3219	0.2450	0.3334	0.3011	0.4813	0.3718	0.3915
Insurance	0.4110	0.5262	0.3524	0.3944	0.3729	0.4628	0.2651	0.3616	0.3677	0.2594	0.3218	0.3699
Inv. & Fin. Services	0.3400	0.4117	0.3754	0.3791	0.5379	0.5096	0.3806	0.3566	0.4287	0.3342	0.3242	0.5504
Media	0.1033	0.2693	0.1434	0.0892	0.3456	0.1155	0.0955	0.0248	0.1727	0.0551	0.0086	0.1488
Misc. Industrials	0.1699	0.2838	0.3139	0.3832	0.4802	0.3911	0.3272	0.3106	0.3703	0.2476	0.2175	0.4794
Other Metals	0.1681	0.2120	0.3962	0.4060	0.2430	0.4203	0.6175	0.4547	0.4126	0.2915	0.5381	0.3248
Paper & Packaging	0.3737	0.4636	0.6356	0.5323	0.4144	0.5350	0.4044	0.3717	0.4789	0.3185	0.2638	0.4374
Property	0.2964	0.4926	0.2369	0.2089	0.3996	0.2570	0.1712	0.0935	0.1893	0.2445	0.3053	0.4424
Retail	0.3280	0.4231	0.4138	0.2009	0.3532	0.4501	0.2598	0.3087	0.3478	0.2834	0.1748	0.3724
Telecom.	0.0363	0.1080	0.1195	0.2296	0.2607	0.0664	0.0814	-0.1009	0.2494	0.1277	0.1085	0.1823
Tourism & Leisure	0.4486	0.4777	0.2990	0.5118	0.5753	0.5277	0.2236	0.3624	0.3365	0.5172	0.3895	0.4306
Transport	0.3652	0.3920	0.2444	0.3408	0.5028	0.3257	0.1534	0.1311	0.3859	0.2635	0.0884	0.3088
fixed int.	0.2394	0.2934	0.0977	0.1958	0.2251	0.1895	0.1204	0.2650	0.2510	0.2812	0.1784	0.0894
cash	-0.0304	0.0330	-0.0500	-0.0382	-0.0147	0.0118	-0.0244	0.0814	-0.0819	0.1182	-0.1135	0.0581
world	0.1912	0.4417	0.2984	0.3331	0.4084	0.3254	0.3440	0.2098	0.4096	0.2342	0.1586	0.2863

(cont.)

	Infrastr. & Util.	*Insurance*	*Inv. & Fin. Ser.*	*Media*	*Misc. Indust.*	*Other Metals*	*Paper & Pack.*	*Property*	*Retail*	*Telecom*	*Tour. & Leisure*	*Transp.*	*fixed int.*	*cash*	*world*
Alcohol & Tobacco	0.4823	0.4110	0.3400	0.1033	0.1699	0.1681	0.3737	0.2964	0.3280	0.0363	0.4486	0.3652	0.2394	-0.0304	0.1912
Banks & Finance	0.3298	0.5262	0.4117	0.2693	0.2838	0.2120	0.4636	0.4926	0.4231	0.1080	0.4777	0.3920	0.2934	0.0330	0.4417
Building Materials	0.2068	0.3524	0.3754	0.1434	0.3139	0.3962	0.6356	0.2369	0.4138	0.1195	0.2990	0.2444	0.0977	-0.0500	0.2984
Chemicals	0.2867	0.3944	0.3791	0.0892	0.3832	0.4060	0.5323	0.2089	0.2009	0.2296	0.5118	0.3408	0.1958	-0.0382	0.3331
Dev. & Contractors	0.5099	0.3729	0.5379	0.3456	0.4802	0.2430	0.4144	0.3996	0.3532	0.2607	0.5753	0.5028	0.2251	-0.0147	0.4084
Div. Industrials	0.3219	0.4628	0.5096	0.1155	0.3911	0.4203	0.5350	0.2570	0.4501	0.0664	0.5277	0.3257	0.1895	0.0118	0.3254
Div.Resources	0.2450	0.2651	0.3806	0.0955	0.3272	0.6175	0.4044	0.1712	0.2598	0.0814	0.2236	0.1534	0.1204	-0.0244	0.3440
Energy	0.3334	0.3616	0.3566	0.0248	0.3106	0.4547	0.3717	0.0935	0.3087	-0.1009	0.3624	0.1311	0.2650	0.0814	0.2098
Engineering	0.3011	0.3677	0.4287	0.1727	0.3703	0.4126	0.4789	0.1893	0.3478	0.2494	0.3365	0.3859	0.2510	-0.0819	0.4096
Food & H/HGoods	0.4813	0.2594	0.3342	0.0551	0.2476	0.2915	0.3185	0.2445	0.2834	0.1277	0.5172	0.2635	0.2812	0.1182	0.2342
Gold	0.3718	0.3218	0.3242	0.0086	0.2175	0.5381	0.2638	0.3053	0.1748	0.1085	0.3895	0.0884	0.1784	-0.1135	0.1586
Healthc. & Biot.	0.3915	0.3699	0.5504	0.1488	0.4794	0.3248	0.4374	0.4424	0.3724	0.1823	0.4306	0.3088	0.0894	0.0581	0.2863
Infrastr. & Utilities	1.0000	0.3693	0.5137	-0.0799	0.2307	0.2910	0.2474	0.6281	0.3782	0.0568	0.5048	0.2751	0.4264	0.1868	0.2529
Insurance	0.3693	1.0000	0.5481	0.1065	0.4405	0.2738	0.3711	0.4015	0.3519	0.0258	0.4039	0.3031	0.3132	0.1449	0.2765
Inv. & Fin. Services	0.5137	0.5481	1.0000	0.3463	0.7011	0.4566	0.4090	0.3493	0.2931	0.5017	0.5091	0.3458	0.2130	-0.0803	0.3991
Media	-0.0799	0.1065	0.3463	1.0000	0.4036	0.0340	0.2005	0.1824	0.0816	0.4258	0.1338	0.2329	0.0935	-0.0763	0.4124
Misc. Industrials	0.2307	0.4405	0.7011	0.4036	1.0000	0.4064	0.4067	0.1358	0.2995	0.5916	0.3495	0.2487	0.0715	-0.1438	0.4746
Other Metals	0.2910	0.2738	0.4566	0.0340	0.4064	1.0000	0.4462	0.1910	0.2090	0.2088	0.4137	0.2394	0.0084	-0.0487	0.2782
Paper & Packaging	0.2474	0.3711	0.4090	0.2005	0.4067	0.4462	1.0000	0.2955	0.4131	0.3661	0.4398	0.2984	0.1517	-0.0989	0.3354
Property	0.6281	0.4015	0.3493	0.1824	0.1358	0.1910	0.2955	1.0000	0.2439	0.1052	0.4397	0.2042	0.3743	-0.0193	0.2643
Retail	0.3782	0.3519	0.2931	0.0816	0.2995	0.2090	0.4131	0.2439	1.0000	0.0408	0.2996	0.2105	0.1171	0.0144	0.2732
Telecom.	0.0568	0.0258	0.5017	0.4258	0.5916	0.2088	0.3661	0.1052	0.0408	1.0000	0.3964	0.3196	-0.0703	-0.1238	0.3649
Tourism & Leisure	0.5048	0.4039	0.5091	0.1338	0.3495	0.4137	0.4398	0.4397	0.2996	0.3964	1.0000	0.3752	0.2434	0.2209	0.3589
Transport	0.2751	0.3031	0.3458	0.2329	0.2487	0.2394	0.2984	0.2042	0.2105	0.3196	0.3752	1.0000	0.1529	-0.0591	0.3945
fixed int.	0.4264	0.3132	0.2130	0.0935	0.0715	0.0084	0.1517	0.3743	0.1171	-0.0703	0.2434	0.1529	1.0000	0.2600	0.1864
cash	0.1868	0.1449	-0.0803	-0.0763	-0.1438	-0.0487	-0.0989	-0.0193	0.0144	-0.1238	0.2209	-0.0591	0.2600	1.0000	-0.0697
world	0.2529	0.2765	0.3991	0.4124	0.4746	0.2782	0.3354	0.2643	0.2732	0.3649	0.3589	0.3945	0.1864	-0.0697	1.0000