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A COMPARED ANALYSIS OF THE PORTUGUESE REAL ESTATE INVESTMENT MARKET ON MATURITY AND TRANSPARENCY ISSUES

ABSTRACT

Most important theoretical developments in finance and investment have been put to widespread practical use, especially in the more efficient securities markets. Real estate investment research has followed these developments, with a 20 year lag, but to some extent, common practice of asset allocation in a property portfolio still relies on qualitative and subjective personal judgment. In Portugal, academic research on property finance is, at least, incipient.

The general objective of this research is the development of a compared analysis of the Portuguese real estate investment market in terms of its maturity and transparency, in order to evaluate the potential of attracting international investment and to provide with foundations for future development. Three fundamental issues are addressed: availability of quality information to develop consistent analysis to support managerial decisions, the existence and nature of institutional property investment and the sophistication degree of professional practices.

The first specific objective is establishing a general characterization of the available information on return of the Portuguese and Iberian direct real estate market nature and also a more specific one in terms of its segmentation structure. There is an intuitive and generalized perception that investors should use a structured approach to portfolio management for the maximization of results, which should be heavily conditioned by the common definitions of market segments. This raises questions on the actual level of reflection of systematic factors that effectively condition returns by the segment structures used in the Portuguese market. Results show that the structures based on Sector differentiation are generally significant and that regional spread does not condition property returns in the periods under study. This evidence supports the argument of Sector diversification, both in the Portuguese market and even in an enlarged Iberian context, similarly to the reality found by in similar research for the UK market.

The second objective is an analysis of the available Portuguese real estate indirect investment vehicles, the real estate investment fund (REIF) industry, concerning its return related information, mostly in terms of distribution features, analysis and predictability. This study develops a detailed characterization of the most important available data on REIF performance, covering sources, base sample, construction methods and also a detailed analysis on the time series data as a basis for future research on performance prediction and attribution models, evaluating consistency, autocorrelation and explanatory relationships between variables and endogenous and exogenous factors. Strong evidence of behavioural heterogeneity across the industry and its subsectors is found. As for return distributions, evidence of non-normality is rather overwhelming, in line with previous findings for other real estate markets. Finally, persistence analysis using contingency tables is developed, in order to further develop on the issue of predictability. Relevant and robust evidence of both short and long term performance persistence within the overall property fund industry and for the restricted universe of open-ended funds was found.

Lastly, the third objective is portraying the sophistication level of current practices and decision-making processes used by the Portuguese organizations managing real estate as a financial asset, emphasising on large portfolio holders. For this, a study based on a survey among a significant sample is developed. This includes REIF management societies, pension funds and large realty investment companies. The survey covers management decision-making practices, use of specific information, indices and databases, the role of appraisal, and the use of quantitative models to support diversification and asset allocation strategies, property selection decisions, performance measurement and benchmarking. The aim is to establish the real gap between theory, practical possibilities and real practice. Research design and results are presented and justified against economic reality, and recent similar studies in other markets.

A COMPARED ANALYSIS OF THE PORTUGUESE REAL ESTATE INVESTMENT MARKET ON MATURITY AND TRANSPARENCY ISSUES

RESUMO

Os mais importantes desenvolvimentos teóricos em finanças foram postos em práctica generalizadamente, em especial nos mais eficientes mercados de valores mobiliários. O investimento em imobiliário seguiu esta tendência com um desfasamento de 20 anos, mas em certa medida, a práctica corrente de gestão de carteiras imobiliárias ainda se baseia em critérios qualitativos e empíricos. Em Portugal, a investigação académica nesta área é embrionária.

O objectivo geral deste trabalho é o desenvolvimento de uma análise comparada do mercado Português de investimento imobiliário em termos da sua maturidade e transparência, de forma a avaliar o potencial de atracção de investimento internacional e bases para futuro desenvolvimento. Três tópicos fundamentais são abordados: a disponibilidade de informação de qualidade para desenvolvimento de análises consistentes que suportem decisões executivas, a existência de investimento institucional e o grau de sofisticação da práctica profissional.

O primeiro objectivo específico é a caracterização da natureza da informação disponível sobre a da rentabilidade dos mercados directos Português e Ibérico e uma análise mais específica das respectivas estruturas de segmentação. Existe uma percepção intuitiva e generalizada que os investidores devem utilizar uma estratégia estruturada na gestão de carteiras para maximizarem resultados, a qual deverá ser condicionada pelas estruturas comuns de segmentação do mercado. Isto levanta questões sobre o nível de incorporação nessas estruturas dos factores sistemáticos que efectivamente condicionam a rentabilidade. Os resultados obtidos mostram que as estruturas de segmentação baseadas no sector são em geral significativas, ao contrário das que usam a dispersão regional, para os períodos em estudo. Esta evidência suporta o argumento da diversificação por sector, tanto para o mercado Português como num contexto Ibérico, uma realidade semelhante à encontrada para o mercado do Reino Unido em trabalhos similares.

O Segundo objectivo é a análise dos veículos indirectos de investimento imobiliário disponíveis no mercado, nomeadamente a indústria de fundos de investimento imobiliário (FII), no que concerne à informação sobre a sua rentabilidade, sobretudo em termos de características da respectiva distribuição de probabilidade, análise e previsão. Este estudo desenvolve uma caracterização detalhada da mais importante informação disponível sobre o desempenho de FII, incluindo as respectivas fontes, amostra, metodologias e ainda uma análise detalhada das séries temporais como potencial base de modelos de explicação e atribuição de desempenho, avaliando consistência, autocorrelação e relações de dependência com factores endógenos e exógenos. Foi encontrada forte evidência de heterogeneidade de comportamento das séries no âmbito da indústria e seus subsectores, e ainda de não-conformidade com os parâmetros de uma distribuição normal, o que está em linha com os resultados obtidos para outros mercados imobiliários. Finalmente, foi desenvolvida uma análise de persistência usando tabelas de contingência, no sentido de avaliar melhor a previsibilidade do seu desempenho. Os resultados mostraram de forma muito conclusiva evidência de persitência de desempenho, tanto de curto como de longo prazo, para o conjunto da indústria e no âmbito do segmento dos fundos abertos.

Finalmente, o terceiro objectivo específico é o retrato do nível de sofisticação da práctica profissional e processos de decisão usados por organizações Portuguesas que gerem activos imobiliários de investimento, sobretudo grandes carteiras. Para tal, foi desenvolvido um estudo baseado num inquérito a uma amostra significativa. Esta inclui sociedades gestoras de FII, fundos de pensões e grandes companhias de investimento imobiliário. Os temas abordados incluem os processos de decisão, o uso de modelos de suporte nas decisões de diversificação e escolha de propriedades, o papel da avaliação, e ainda medição e comparação de desempenho. O objectivo é o estabelecimento do desfasamento real entre a teoria, as possibilidades práticas e a realidade. A metodologia e os resultados são apresentados e justificados com base na realidade económica específica, e tendo em conta estudos similares noutros mercados.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABREVIATIONS

The following abbreviations, acronyms and initials are used along the text:

Analysis of Variance	ANOVA
Arbitrage Pricing Theory	APT
Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios	APFIPP
Autocorrelation	AC
Capital Asset Pricing Model	CAPM
Comissão do Mercado de Valores Mobiliários	CMVM
Consumer Price Index	CPI
Cross-Product Ratio	CPR
European Economic Community	EEC
European Union	EU
European Valuation Standards	EVS
Goss Domestic Product	GDP
Gross Lettable Area	GLA
Herfindahl-Hirschman Index	HHI
Holding Period Returns	HPR
Instituto de Seguros de Portugal	ISP
Instituto Nacional de Estatística	INE
Internal Demand	ID
Internal Rate of Return	IRR
Intertemporal Capital Asset Pricing Model	ICAPM
Investment Property Databank	IPD
Lisbon Euronext Stock Exchange	LESE
London Stock Exchange	LSE
Lower Partial Moment	LPM
Mean Absolute Deviation	MAD
Modern Portfolio Theory	MPT
National Association of Real Estate Investment Trusts	NAREIT
National Council of Real Estate Investment Fiduciaries	NCREIF
National Property Index	NPI
National Real Estate Investor	NREI
Net Asset Value	NAV
Net Present Value	NPV
Partial Autocorrelation	PAC
Pension Real Estate Association	PREA
Portuguese Stock Index	PSI20
Production of the Construction Industry	PDI
London Stock Exchange Real Estate Index	FTSERE
Real Estate Investment Fund	REIF
Real Estate Investment Trust	REIT
Real Estate Research Corporation	RERC
Real Estate Research Institute	RERI
Repeat Sales Regression	RSR
Royal Institute of Chartered Surveyors	RICS
The European Group of Valuers' Associations	TEGoVA
United Kingdom	UK
United States	US

In memory my first and foremost teacher,
my grandmother, Albertina Vaz Pinto.

CHAPTER 1 - INTRODUCTION

1.1 PREAMBLE

Real estate is one of the oldest investment asset classes in world. However, the special features of this type of investment, namely its heterogeneity and illiquidity, among others, have not enabled it to attain the sophistication level of other asset markets. Common sense has generalized the notion of real estate investment as a business with a dominant local perspective. When addressing any type of direct real estate investment, local expertise and market inside view are often regarded as fundamental for success. In fact, real estate is largely affected by geographical and specific factors but that is not all: it is privately traded and commonly believed to be far from efficiency in any form[1]. At a glance, these facts should convey an entrance barrier, or in other words, they may limit heavily the power of the market to raise any interest in an investor that departs from an outsider position.

However, current reality seems to go against this notion. Internationalization has been a tangible contemporary movement in many areas of investment for the last years. Its importance is crucial and rising in a globalizing world. Cross border investments in real estate are no exception[2] and today commercial property investment is largely a global business with multi-local perspectives. This fact has been both cause and consequence of the economic globalization and is also very much driven by mounting investment capital availability and growing interest in diversifying away from the main asset classes.

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[1] The efficiency concept refers to Fama (1970). Specific references to the inefficiency of the real estate market can be found in Graff *et al.* (1997), Grissom *et al.* (1998) and Louargand (1998), among many others.

[2]For recent specific reference see e.g. Lee (2005) , Brounen *et al.* (2007), Lynn (2007) and Laposa (2007)

The structure, risk, difficulties and opportunities that may be encountered when addressing a foreign market in a perspective of inducing local real estate investment are well characterized by the two generalized concepts of maturity and transparency[3]. The essence of these concepts is most contained directly in the words themselves. A mature market is a complete and well developed trade environment that includes a structure of players, consultants and institutions that provide it with stable and qualified activity. A transparent market is one where most or all of the information is available without bias or censorship and regulatory terms are clear and actively enforced. Although the two are not synonyms, they are heavily and closely related and, in fact, do complement each other, which generally binds them together in a single, more general concept that is often simply named just by one of the two words.

The widespread concept of maturity and transparency of a real estate market addresses and covers the four main issues that shape the market: structure, professionals, information and regulation. It embodies and affects all of the stakeholders in a global property market: owners, investors, lenders, occupiers, developers and service providers.

Regarding structure, the maturity level of a market is strongly correlated to the level of institutional investment and property investment securitization it withholds. Institutional investment is a strong driver of information availability, operation transparency, market stability and best practices, and in return its growth is also a consequence of them. Securitization of real estate investments provides the general public with easier access to property investments through indirect vehicles, which are also very interesting for large private and institutional investors. Despite the fact that they may represent equity

[3] Maturity and transparency of a real estate market are concepts familiar both to the academic and to the professional universe. Starting reference can be found in Brounen *et al.* (2007), Lynn (2007), Jones Lang LaSalle (2006a) and Louargand (1998).

or debt rights on large, well diversified and professionally managed portfolios which include mainly high value illiquid property, these vehicles are liquid, have small unit values and are traded in central markets. This eliminates many of the inefficiencies of real estate while it maintains the exposition of the investor to the specific factors that originate real estate return. It also provides the market with proxies that are very useful to relate to the value and return of the underlying assets[4].

The degree of sophistication of property related professionals and of their practices, including advisors, managers, brokers, among others, reflects both the reality of demand of the market players for internal and external agents and the quality of the support services and structures that are available. To find reliable local support in operation and advisory services, to certify the quality of property investment management professionals acting in a fiduciary environment is of strong importance for any investor and mostly for a foreign investor.

1.2 STATE OF THE ART

The existence of extensive, consistent and significant information flows and research activity (professional and academic) regarding the property market, credits the support services network and the market itself. Development can only emerge from the integration of knowledge and information, and the real estate market is no exception. Most important academic theoretical developments in finance and investment have been transferred to widespread practical use, especially in the more efficient securities markets. Real estate investment research has followed these developments, with a lag of about 20 years, and in leading mature markets like the United States (US) and United

[4] Starting reference for the concept of real estate securitization can be found in Graff (2006).

Kingdom (UK) there is a consistent body of knowledge on property investment and finance and an extensive amount of quality information regarding the total return of this asset class, its components and the return of its segments (see e.g. Louargand, 1998, Young *et al.*, 2002 and Cheng *et al.*, 2000). A highly skilled academic community is heavily committed to the development of complex specific real estate adapted models that may overcome the main problems that arise from the application of traditional theories developed on liquid securities markets to this asset class (see e.g. Coleman *et al.*, 2005 and Ellis *et al*., 2005). The professional community on its side is attentive and receptive to these developments and important interaction between academia and industry is noticeable (Newell *et al*.,2004). However, to some extent, common practice of asset allocation decisions, investment selections, maturity decisions and others, in a property portfolio, still relies heavily on qualitative and subjective personal judgment, experience and intuition (Ziering *et al*., 1997 and Newell *et al*., 2004). This may indicate that actual quantitative models are still difficult to apply or not correctly specified in real situations.

Despite the recent growth of property related research, it still is very much centred in the US and the UK markets, which is highly justifiable on the basis of their size, importance, history and on the existence of a consolidated background of information and knowledge, just to mention the main factors. Arousal of interest in other markets, especially other European Union (EU) countries is noticeable, be it driven by internal agents or by the internationalization phenomenon, but production is much more scarce and potentially proportional to the size and interest that each given market has on the overall scene (see e.g. D'arcy *et al.*, 1998 and Brounen *et al.*, 2007).

There is a general perception of dramatic evolution in the last twenty years in the Portuguese commercial real estate market, especially in the last decade. This

development encompasses many central issues: the market's structure, tax regulations and legal framework, the market's players and the related professionals, internationalization phenomena, nature of demand and supply, among several others. However, some aspects have been quite disregarded, or maybe their development has started in recent and hesitant fashion. Among these is certainly property finance research. In Portugal, academic research on property finance is, at least, incipient, containing only a mere few significant references, like Silva (2005) and IPD/Imométrica (2005), among others[5]. In spite of this, significant academic interest and valuable work has been developed over the last 20 years on other related areas like appraisal and valuation, project finance and land development.

1.3 OBJECTIVES AND JUSTIFICATION

The general objective of this work is to provide a characterization of the Portuguese real estate investment market in terms of its maturity and transparency, in order to better evaluate the potential of attracting international investment. It aims at providing a better understanding of the real characteristics of this market, pointing out potential development directions, but also at being a starting point for the development of consistent and more intensive future research on the Portuguese property market.

In more detailed and precise terms, this study intends to attain the three following specific objectives described in the next paragraphs, which address three of the four vectors that were previously referred to as fundamental to the maturity and transparency

[5] These two references concern papers on very specific subjects, which are expanded and commented in Chapter 3. The existent research for the Portuguese market is limited to a very small number of works, regarding relevant, but disperse and dissociated subjects. In Chapter 3, all the relevant work is referenced and, in fact, the count of significant publications is a one digit number.

concept: (1) the existence and nature of institutional investment and property securitization, especially regarding the one that enables public indirect investment; (2) availability, extent and relevance of quality information as a support of consistent analysis and managerial decisions, namely for use as base data in predictive and explanatory models that may assist and improve investment decisions; (3) the sophistication degree of professional practices.

The first objective is establishing a characterization of the nature, constitution and scope of the available information on return of the direct Portuguese real estate market nature, most specifically in terms of its segmentation structure. In fact, there is a general perception that investors should use a structured approach to portfolio construction and management for the maximization of results, which should be heavily conditioned by the structure of the available information, or in other words on common definitions of market segments. According to Devaney (2003) these tend to reflect the different systematic drivers of performance or the differing sensitivity of assets to those drivers. However, evidence reveals that in real estate investment, high levels of specific risk are to be expected and systematic influence of segments on returns may not be as significant as in other asset classes. This raises the question of whether if any specific segment structure in the market reflects enough of the systematic influences for their use in portfolio construction to be worthwhile. Hence, the present study has the specific objective of providing an answer to that question within the scope of the Portuguese market.

The second objective is the development of an analysis of the nature of the available Portuguese real estate market indirect investment vehicles, specifically the real estate investment fund (REIF) industry, their return and related information, mostly in terms of distribution features, performance analysis and predictability. Performance prediction

and asset allocation models should de able to incorporate effects from current and future endogenous (e.g. traducing persistence, autocorrelations and other) and exogenous market factors and should consider the real nature of return distributions (Coleman *et al*., 2005). Lizieri *et al*., 2001 recommend caution in using published property based performance indices and the previous examination of the structure of returns, especially in valuation based indices, which is the case with REIFs and other unitized investments. However in the national market, regarding the scope of the available related information, very scarce research on it can be found. Moreover, due to the appraisal base of fund unit valuation, the delays in valuation updating within the net asset value (NAV) calculation, which lead to non-homogeneous arbitrage opportunities and to unintended and wealth transfers between buyers, sellers, and long-term holders of fund shares (Redding, 2006) and to specific fragilities of open-ended funds regulatory frameworks (Bannier *et al.*, 2007), the reality of fund valuations and returns is potentially questionable. Hence, this study develops a detailed characterization of the most important data on the performance of REIFs that is available to date, covering sources, base sample and construction methods and also a detailed analysis on the time series data available as a basis for future research on performance prediction and attribution models, including time series trend analysis, return distribution analysis, discovery of endogenous and exogenous explanatory factors, research on eventual evidence of short and long term performance persistence.

Lastly, the third objective is portraying the sophistication level of current management practices of the Portuguese property institutional investment professional community, concerning asset allocation decisions, property selection, appraisal and usage of structured information on the development and support of investment decisions.

In a country where primary housing necessities are no longer a main driver for the construction industry, land development in the larger metropolitan areas is becoming increasingly driven by institutional national and international investment in retail, offices, tourism, healthcare and qualified housing. A better understanding of the reality and dynamics of this market will certainly provide a valuable input to the perception of the future reality of local demand for the construction industry.

Present challenges to the national property investment market, to its players and professionals are substantial, and will necessitate the raising of competence levels, through adequate knowledge and information management. International emerging realities like the ever growing international availability of public property based classic and derivative securities, investment globalization and constant operational delocalization, will dramatically change the concepts in which real estate investments are based, enlarging the range of possibilities, scope of investors and market players, in a word, competitiveness.

Hence, a more adequate and complete knowledge about the present reality of the industry, namely the quality of the available information and its sources, the significance of the most used market segmentation structures, the characterization of the REIF sector, as the main indirect property investment vehicle, in a pure perspective of financial performance and the perception of the level of sophistication in current professional practice is highly relevant as a base for a mandatory evolution and development, as widely demonstrated by the different realities of other more mature markets that are described in further detail in the subsequent chapters.

For all this, the present work and its objectives are significantly relevant in terms of research and development within the scope of the scientific, academic and professional communities.

1.4 METHODOLOGY AND ANALYSIS

As a foreword for a better understanding of the Portuguese local and specific reality and to provide a background reference for the subsequent chapters, a general qualitative characterization of the national real estate market was developed and presented, including both the present reality and the historical background and evolution of institutional investment, for a better understanding of the forces and dynamics that are currently present in the market, their origin and their nature.

The detailed characterization of the data regarding performance of the direct real estate investment market for prediction and allocation purposes covered the analysis of the index sources, base sample and construction methods and especially an examination of the effectiveness of the segmentation structures used. In this study, the segment structure that is used by the *Investment Property Databank (IPD)/Imométrica*[6], as the only provider of return data on direct property, is evaluated. The ability of segments to explain market returns is tested against a null hypothesis of no explanatory power. As segments are defined to group properties that perform in a common way, it is expected that they will explain a significant amount their returns. Specifically regarding segmentation structure, despite the main scope of this study being the Portuguese market, in this case the consideration of an enlarged scope that included also the Spanish market came as a natural extension due to the similarity of the index structures and history, and also to the proximity of the two countries and the very strong economic and social ties.

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[6] The Investment Property Databank (www.ipd.com) is a multinational private company, dedicated to the measurement, record and analysis of real estate performance for owners, investors, managers and occupiers. In Portugal it is represented by Imométrica Lda (www.imometrica.pt).

The analysis of the available information regarding indirect vehicles aims at evaluating its possibilities for serving as data for performance prediction, benchmarking and allocation models. Performance measurement, benchmarking and forecasting are fundamental for modern asset and portfolio management. The available time series of indirect indices regarding performance of the Portuguese property market are identified, characterized for scope, construction method and representativeness. Furthermore a detailed time series analysis is developed, including trend analysis, descriptive statistics, segmentation and return distribution characterization. Detailed econometrical analysis is developed, in order to evaluate consistency, autocorrelation and explanatory relationships between variables and endogenous and exogenous factors. Finally, persistence analysis using contingency tables is developed, in order to further develop on the issue of predictability. Results are commented on against other international realities.

Lastly, for the characterization of the current practice and decision making processes used by organizations and professionals managing real estate as a financial asset, with emphasis on large portfolio holders, a study based on a survey among a reference group of managers of large real estate portfolios is developed. This includes real estate fund management societies, pension funds and significant real property investment companies. The survey covers management decision-making practices, use of specific information, indices and databases, the role of appraisal, and the use of quantitative models to support diversification and asset allocation strategies, property selection decisions, performance measurement and benchmarking. The aim is to establish the real gap between theory, practical possibilities and real practice. Research design and results are presented and justified against economic reality, and recent similar studies in other markets.

To the author's knowledge, there has not been to date any study with the same integrated objective, nor one that has addressed to a comparable extent any of the singular objectives here contained. Partial studies on related subjects, namely appraisal, structure and performance of REIFs like Laureano (1995), Razina *et al*. (2005), IPD/Imométrica (2005) and Silva (2005)[7] have addressed singular important related questions, but from a rather different perspective, which in some way is also a purpose of this study to complement.

1.5 ORGANIZATION OF THIS DISSERTATION

This dissertation comprises seven chapters. In this brief introduction that comprises Chapter 1, the general background and objectives of this work are presented. Also, the fundamental justification for the development of this research and the organization of this dissertation are revealed.

In Chapter 2 a characterization of the existent institutional investment and of its nature is presented, including its present reality, historical background and evolution. This characterization is designed to be a foreword for a better understanding of the Portuguese local and specific reality and to provide with background for the subsequent chapters.

In Chapter 3 a thorough review and discussion of the literature is developed. The objective is to provide a perspective of the global state of the art in this field, as a background for the empirical research work developed and presented in the subsequent chapters. It comprises a review of the literature related to time series analysis of property indexes, integrating index construction methodology, the application of the

[7] All of these references are generally cited within their specific context in the subsequent chapters.

most recent econometrical models and research conclusions regarding the risk and return of underlying assets, segments and the overall market. Secondly, the subjects of portfolio construction and optimization are addressed. Issues reviewed include segmentation according to explanatory return factors, asset allocation, property selection, portfolio optimization and overall performance analysis and evaluation of portfolios and management. Special emphasis is given the specific subject of real estate investment funds performance analysis and predictability.

Finally, relevant work available on the characterization of professional practice of property asset and portfolio managers is reviewed regarding methodologies and results regarding its level of sophistication and the current application and use of related theoretical and applied research.

The empirical analysis contained in this research is contained in Chapters 4 to 6. In the first one, the available time series of direct indices are identified, characterized for scope, construction method and representativeness of segmentation structures. The ability of segments to explain market returns is tested. As segments are defined to group properties that perform in a common way, it is expected that they will explain a significant part of their returns. Specifically regarding segmentation structure, despite the main scope of this study being the Portuguese market, in this case the consideration of an enlarged scope that included also the Spanish market came as a natural extension due to the similarity of the index structures and history.

In chapter 5, a detailed time series analysis of indirect indices (from the REIF sector) is developed, including trend analysis, descriptive statistics, segmentation and distribution properties, autocorrelation and explanatory relations between variables and endogenous and exogenous factors. Finally, persistence analysis using contingency tables is

developed, in order to further develop on the issue of predictability. Results are commented on against other international realities.

Chapter 6 covers the study based on a survey among a reference group of managers of large real estate portfolios which is aimed at the characterization of the current practice and decision making processes used by organizations and professionals managing real estate as a financial asset. Research design and results are provided in detail, analyzed and justified against economic reality, and recent similar studies in other markets.

Finally, Chapter 7 summarizes the main contributions and conclusions of this research. The chapter includes a discussion of the limitations of those conclusions while suggesting directions for future research.

CHAPTER 2 - THE PORTUGUESE INSTITUTIONAL REAL ESTATE INVESTMENT MARKET

2.1 INTRODUCTION

This Chapter aims to be an overview and general characterization of the Portuguese real estate market, as background reference for subsequent chapters. In this way, as real estate demand and supply are closely linked to the social and economical reality of a market, it starts by providing a brief historical reference on the macroeconomic situation and its influence on the property market reality.

Deriving from this context, some of the main aspects of the legal and tax framework on property transaction and rental are presented, thus enabling a better understanding of following evidence presented regarding the characterization of the direct property market, especially the one related to commercial real estate. The importance of institutional investment on property assets within the scope of this dissertation justifies the inclusion of a specific portrait of this market. Investor types, management styles, evolution of legal framework and portfolio characteristics are covered to the extent required by the formerly described objective.

Lastly, a perspective of further insight into the link between the real estate market and the construction sector is presented, and the importance of the change of paradigm in this relation is justified. Future trends and challenges in the sector are outlined as a conclusion of this chapter.

2.2 A BRIEF HISTORICAL OVERVIEW

In the last century, like in many other European countries, the Portuguese economic activity has been largely conditioned by purely political factors. The different regimes and government models have had strong repercussions on the structure of the economy,

its agents and its rules, from severe binding and conditioning by political directives, to direct effects on established rights, including, among others, the ones related to property ownership and tenancy. The scale of such influence seems largely unrelated to reality of the present semi-mature democratic establishment. Nonetheless, the time distance to other very different realities is not that large, and in fact, as demonstrated ahead, that recent past still influences our present in a significant way.

In 1974, Portugal ended a 56 year totalitarian regime, with a political revolution that opened way to a newborn democracy, based on a socialist constitution. In the first years, there was a nationalization of many productive structures, private property and other assets, but also private illegal takeover. Hence, focusing on the democratic period only (the last thirty three years), two different stages may be distinguished: firstly, the years from the political revolution, occurred in 1974, until the admission of the country to the European Economic Community (EEC) in 1986 - a turbulent transition period to stable democracy, with significant economic and social instability; secondly, from then to the present, a continuous evolution in social and economic terms, based on more stable internal conditions and external support, with a national objective of progressively rising to the average standards of the reference countries of the EU. In spite of considerable political and economic reforms along the years, some of them still rather recent, the legal and social framework that resulted from the last decades of the dictatorial period and the years of the post revolutionary period has conditioned recent economic reality in various ways, and will continue to do so, although with progressively fading intensity. This is especially true in terms of the real estate market[8],

[8] The present work provides a general overview on this subject as a preamble to the following chapters, and not a detailed historical analysis of the evolution of the Portuguese real estate market. Nonetheless, the references provided herewith may base further in depth research on this topic.

especially regarding aspects like specific legislation, tax regulations, social environment and the structure of the financial market.

As recognized in the preamble of the proposal for the recent new property rental law (Governo Português, 2005), legislation has largely conditioned the housing rental market for decades, imposing rental freezing and over-empowering tenants, essentially on the grounds of the existence of a primary social need for accessible housing from a large amount of the population[9].

Despite mild attempts to overcome this problem by legislative initiatives in the 1980's and 1990's, the rental market has remained in a paralysis situation, which has developed in a parallel way to a significant degradation of urban centres, due to the incipient level of economic return provided by ancient rental contracts. These were in practice close to perpetual in nature, thus not enabling owners to promote the necessary building renovation. In this way, the vast majority of people actually opt for own house acquisition, which largely increases familiar financial liabilities[10], enforces labour mobility constraints, downgrades the market in terms of offer and imposes irrational needs for public infrastructures to stretch to suburban areas when urban centres are becoming deserted. The previously referred preamble suggests that the four hundred thousand contracts with frozen rents[11] are in some situations essential for the survival of their tenants, which are in many cases low income families and social security beneficiaries. However it also asserts that many owners are in a financial situation as

[9] In this document a brief but significant history of the legal framework on house leases in the last century is presented.

[10] Statistic data from Banco de Portugal (www.bportugal.pt) shows levels of non-performing loans of around 10 to 15% of global mortgage volume, varying according to the economic cycle.

[11] Figure is quoted from Governo Português (2005).

fragile as their tenants, as their asset's return and market value does not match the liabilities they impose.

In an institutional perspective of buy-and-hold property investment, this reality almost completely excludes the habitation sector from the range of potential assets. In fact, in the Portuguese market, the investment in the housing sector is almost entirely destined to opportunistic property development for immediate sale, being a rather relevant industry. This kind of investment is naturally more relevant in the portfolios of private equity companies or closed-end funds and less so in the public open-ended funds. The housing shortage that lasted until the late 1990's together with the economic and social development of the last 20 years fostered a continuous rise in property investment, making it historically regarded as an almost non-risk investment, until recent years, when supply has finally exceeded demand, bringing the market to an effective stagnation or recession in many sectors, especially in used homes and many low quality suburban areas (Figure 2-1).

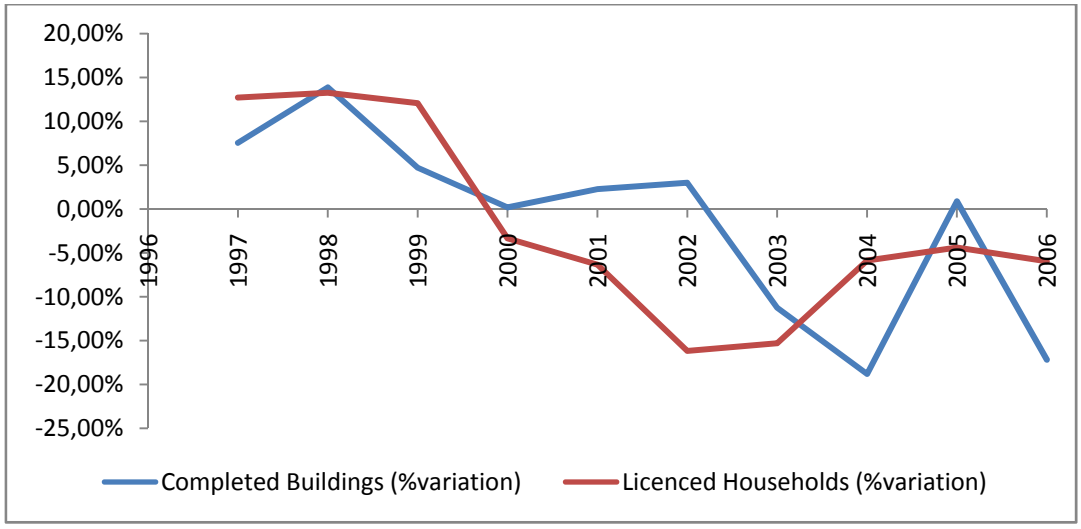
Another sensitive issue for market inefficacy are property taxes. Until recently tax reference values were completely obsolete for older buildings and in general not related to market values (Pinto *et al.*, 2000). This sets an unconditional bias on any control on the real estate economic sector that may be derived from tax information. Fortunately, new tax regulations published in 2003 have imposed a revaluation of buildings for tax purposes, closer to a market reality, but still suffering from considerable bias, which, in any case, is still not fully implemented to date.

Also relevant, both in terms of the private and institutional property investment, is the structure of the financial institutional market, which has been strongly conditioned by a recent history of nationalizations, after 1974, and consequent re-privatizations, from the late 1980's onward. This has had effects on the quality of processes, human capital, organizational skills, competitiveness and others, which have distressed the efficiency

and effectiveness of support provided by this industry to the investment market in general, and the real estate specifically. The Portuguese central bank report (Banco de Portugal, 1997) refers to the constraints on the structure of banking activity, market competitiveness, credit limits, interest rate regulation, and international activity, among others, as being abolished in the liberalization of the banking system that lasted until the mid/late 1990's.

Figure 2-1 – Completed Buildings

This chart presents the variation in the total of annually completed buildings for all purposes and total variation of new licensed households within the Portuguese territory (source INE, 2007).



Also a pertinent fact to the evolution of the commercial property market was the entry of external investors in the national market and the internationalization of national financial institutions, following the sector liberalization. Since the early 1990's, significant capital inputs have come from abroad to be applied in the national commercial property market[12]. Many of these investments were and still are supported by national management developed on international sophisticated procedures, thus

[12] See e.g. Healey&Baker (2001).

implying knowledge transference, thus raising standards in competitiveness, managerial skills and performance. Nonetheless they are still a market minority, as perceived by the percentage of international investment within the total asset value backing the Portuguese IPD index, which was of about 15% at end of 2006[13].

Previous evidence on the recent history of the market and of the related social and economical environment indicates that a level of maturity and background experience in stable environmental conditions, as in other reference markets in the EU, can hardly be expected, which is, of course, extended to the majority of the market players and the professional community.

2.3 COMMERCIAL PROPERTY DIRECT MARKET STRUCTURE

The commercial property market is composed essentially by the office and retail segments, with the industrial segment also coming in to the scope of institutional investors in the last decade. The IPD index, as of end 2006, was supported by a global portfolio that included over 50% in retail property, about half of that percentage in offices and under 10% in industrial property, all referring to property value[14]. Claiming to represent about 54% of the institutional investment market, the Portuguese IPD index covered a consolidated portfolio value of 7800 million Euros at end 2006, which provides a conservative estimate of a global market value covered by institutional investment of over 15000 million Euros.

[13] Source *IPD Portugal 2006 Annual Results Presentation* (IPD, 2007b).

[14] All the data quoted in this and the next paragraph is retrieved from the *IPD Portugal 2006 Annual Results Presentation* (IPD, 2007b) .

Investment return of the in the Portuguese commercial property market has maintained minor fluctuations around an average of over 11% in the last five years, which is slightly similar to the average of the consolidated European index for the same period. This has proven, during the first years of the present decade, to be a remarkable good and steady performance in comparison to other asset classes, providing the best average return with a very small volatility (Figure 2-2). It should be remarked that in Portugal, yields and rent returns are generally above most of the other European markets, which in turn have presented better results in terms of capital growth, especially in the office sector. Within the realty universe, the least performing has been the office sector, while the retail segment has leaded the return of property investment in the current decade. Typically, institutional investors like real estate funds and pension funds are more exposed to the steadier, but less management-demanding, office market, while the challenging retail sector has been dominated by only a small set of very specialized operators/investors, some with significant and renowned international activity.

In terms of geographic diversification the office market is mostly restricted to Lisbon and Porto, with a special emphasis on the first. Despite a considerable growth in the last decade, the Lisbon office stock is now growing at a tentative pace, with a total just exceeding four million square meters at the end of the year of 2006, while the Porto market at the same time accounts for circa 750.000 square meters[15]. Office vacancy rates vary heavily according to sources, with figures for vacancy rates in the Lisbon office market ranging from eight to circa eighteen per cent in terms of area, depending on the source[16].

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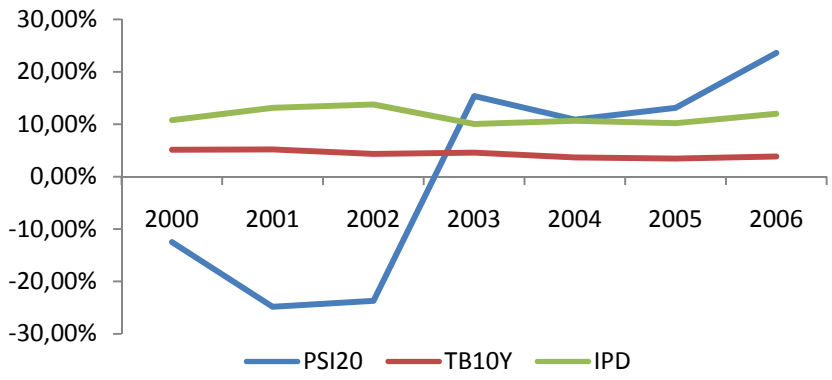
[15]Sources: CBRE (2006) and Jones Lang LaSalle (2006b)

[16] Sources include lead market brokers/advisors and IPD/Imométrica, with broker research reports providing the lowest numbers. Specific comparisons are not included in the aim of this work, hence they are not presented.

Figure 2-2–Annual returns per investment type

This chart presents the evolution of annual average returns per investment type, in the period of 2000 to 2006, covering the real estate market (here represented by the Portuguese IPD/Imométrica index), the Lisbon Euronext Stock Market (represented by the PSI20 index) and the average return on 10y T-bonds. Sources include IPD/Imométrica and Banco de Portugal.



Lisbon is still in a secondary league of European office capitals, but presenting a good diversification potential, with gross yields in a downturn, but still above 7%, thus making it a fairly attractive offer in the potential investor's point of view in comparison with most of the European capitals[17]. Nevertheless, capital appreciations have been almost non-existent in real terms. In the occupier's perspective, off or near-shoring operations in Lisbon is a growing option with a rising potential in the near future[18], with the real estate being one of the main high factors, especially because of the low cost of rents, which average at circa 200€/m^2/year, together with the availability of quality office space.

[17] Different sources present similar results and conclusions on this issue. See e.g. IPD (2007b), Jones Lang LaSalle (2006b) and CBRE (2006).

[18] This is confirmed by specific extensive professional research reports like Cushman&Wakefield (2006) , which rate Lisbon at mid table of most attractive cities within which to locate a business in Europe.

In the last five years, a considerable growth, together with an average total return of over 15%[19] and very low vacancy rates, have made retail the star segment of a swelling and maturing market, with a special contribution from shopping centres. Certainly the existence of national companies widely recognized as major international players in this sector has also contributed to make the internal market a rather competitive and sophisticated one. At the end of the year of 2006, stock had reached over 2.6 million square meters of gross lettable area (GLA). Taking into account projects which are already confirmed, future supply rate will keep high with more than eight hundred thousand of new GLA expected to appear on the market each year, until 2009[20]. Part of this supply is being promoted by investors that are newcomers to a very competitive and rather developed market, so a question for the future is their ability to keep the average management quality standards that have made the profitability of this segment and boosted capital appreciations.

The industrial sector has been a traditional diversification option for institutional investors in the last decade, enabling the access to higher yields than in other segments, although still with quite low vacancy rates due to considerable demand and still a lack of quality supply. Nevertheless, although yet a marginal sector in terms of capital value in the institutional property real estate portfolio, specific investment volume in industrial property has paired with both the retail and the office sectors in 2004, despite not being able to keep up with these in the last two years[21].

[19] Source: IPD (2007b).

[20] Source: Jones Lang LaSalle (2006b).

[21] Source: IPD (2007b).

2.4 INSTITUTIONAL INVESTMENT AND INDIRECT VEHICLES

National institutional investors, acting in a long-term buy-and-hold perspective are grouped in a rather limited number of types, as allowed by the present legal framework and conditioned by market reality. These include real estate investment funds, plan sponsors and a very small number of large property investment companies.

Real estate investment funds (REIFs) are in terms of property asset volume under management by far the most representative type of institutional investor in Portugal. Their legal framework was first established in Portugal in 1986. It is still a rather young industry which has had a considerable growth and evolution in its 20 years of existence. By the year end of 2006, a total of 181 different real estate funds were operating, of which 16 are open-ended and 165 are closed-end funds, with a total property asset value of circa 10.000 million Euros. These are administered by a total of 32 managerial societies, with only 10 being responsible for more than 80% of the global asset volume and mostly related to the major financial groups acting on the national market[22]. However, according to the same report, the Herfindahl-Hirschman Index (HHI), which evaluates the concentration of the market, has been slowly dropping, being 857,68 at the year end of 2006 [23].

As in other markets, REIFs are an indirect property investment vehicle with exclusive tax exemptions. General reasons for exempting indirect real estate investment vehicles include the intention to make investment in the property market more accessible to the

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[22] Source: *Relatório de Gestão de Activos*- 4ºTrimestre (CMVM, 2006).

[23] The Herfindahl-Hirschman Index (HHI) is calculated as follows: $HHI= \Sigma S_i^2$ (where Si is the market share of each entity). It varies between zero (exclusively) and a maximum of 10.000 (total concentration or monopoly). Generally a value under 1.000 is associated with a diversified market.

general public and the purpose to create favourable conditions for the overall increase of institutional investment. The relevance given to institutional investment on property can be justified on social and economical grounds, regarding housing development, property market stability, urban land development, induction of national and international investment in a primary industry and many others. Positive transparency and maturity effects on the real estate industry altogether are also non-negligible (see D'arcy *et al.*, 1998 and Brounen *et al.*, 2007) as factors for the establishment of this type of legal framework for realty funds. The property fund industry currently manages a global net asset value (NAV) of property based investment considerably larger than that of plan sponsors and major national real estate companies, which in turn have no special tax treatment. In fact, REIFs are the major indirect real estate investment vehicle for plan sponsors, private companies and other institutional investors acting in a long-term buy-and-hold perspective. Further supporting this reality is the factual non-existence of any property investment companies quoted on the Lisbon Euronext Stock Exchange.

On another key, closed ended funds represent presently over 50% of the industry in terms of total value under management, and have had an exponential growth in number in the last couple of years. A large number of those funds have lately been originated in very limited or even single sets of investors, which have incorporated capital under that specific legal form mainly with the objective of being able to profit from this fiscal regime for very specific property investments, mostly opportunistic ones. This situation is built on the same legal framework, but is questionable for not complying with some of the principles behind it, especially with the diversification of the investor base[24].

[24] Recent changes, in 2007, have reduced these tax advantages for closed-ended funds with a very limited number of private participants (e.g. excluding collective investment institutions).

The REIF industry has been a main actor in the remarkable evolution that the Portuguese property market has experienced in the last 20 years. It provides the only public indirect investment vehicle available in the market and a primary mean for the public securitization of equity property investments, with a natural consequence in the industry's transparency.

However, there is a clear perception that some development in transparency and regulatory issues are critical to enable further sustained evolution. Specific issues around this subject are discussed and studied in detail in Chapter 5, especially relating to the fact of property valuation being ultimately dependent on the management, which enfeebles the rigour and conditions the transparency of valuation and return measures. More conservative asset allocation strategies, based mostly on the office market, which are also derived from limitations in management structures, may justify the fact that the performance of the REIFs' direct portfolio appears to fall below the market, both as measured by IPD (2007b). However, the return of the REIFs' portfolios apparently largely exceeds their effective return as an indirect investment vehicle, measured through unit value appreciation and yields over the holding period[25]. When tax exemptions are added to the equation, the inevitable questions appear: to what level are REIFs basing their activity and performance goals on the tax exemptions, and to what level do these induce significant inefficiencies? Is the return of REIF's property portfolios not entirely and directly translated to the base unit value and therefore not transmitted to investors? Some evidence on these subjects is brought by Silva (2005) and IPD/Imométrica (2005).

[25] According to IPD (2007b) the average annualized performance of the direct REIF portfolio was 9,2% while the overall market performance was 2% higher. According to the data from *Associação Portuguesa de Fundos de Investimento Pensões e Patrimónios (APFIPP - see* www.apfip.pt)- and to the results presented on Chapter 5, REIF returns on comparable periods are generally under 6%. The difference is not justifiable only by specific costs like management fees or other.

Another relevant issue is that the path of evolution will necessarily go through the internationalization of the REIF's activity, both regarding the capture of international participants and the externalization of operations. Here too, regulatory issues and transparency are of primary importance. REIF's cross border investment is yet taking its first steps. It was until recently limited by regulatory issues, namely the possibility of investment through indirect vehicles. However, cumulative taxation problems remain due to non-integrated tax regulations across the EU.

Pension funds have about 13% of their total portfolios directly or indirectly invested in property, totalling over 2500 million Euros[26]. Although the real estate portfolios of most large pension funds are managed by skilled professionals in real estate and are therefore able to invest directly, the global tendency is to find ways to invest in realty in association with specialized entities with significant market experience – property investment companies and managerial societies responsible for real estate funds. This can take various forms, from partnerships designed for a specific project to indirect property investment in the form of fund units or company shares (Machado, 2001 and Maurer *et al.*, 2002). Hence, pension funds are growing in importance in a global context of institutional real estate investment, and in fact the growing percentage of total assets invested in real estate is much higher than in other reference markets and closer to the theoretical optimal allocation (see e.g. Batjelsmit *et al.,* 1995, Booth, 2002 and Brown *et al.,* 1996, among others). It is also worth noticing that regarding property valuation, funds there are much fewer transparency issues within the context of pension than within the REIF regulation, despite the more illiquid nature and longer term maturity of the first.

[26] Source: Instituto de Seguros de Portugal (2005). *Instituto de Seguros de Portugal* (ISP) is the national supervisor of pension fund activity.

The three major private Portuguese real estate companies managed a total asset volume of circa 7.000 million Euros at year end 2006. Within this amount there is a significant proportion of cross-border investments (more than one third) and also a great deal of investments managed on behalf of other owners or co-owners within specific partnerships[27]. Most of this asset volume is allocated to direct investment in the retail sector, justified by significant and recognized specialization. By far, these few private companies are commonly recognized as the most sophisticated and highly performing group of institutional property investors, which is acquainted both by the nature and extent of their operations and also by their activity indicators. Finally, it should be stressed that none of them have made public any part of their capital. The logical implication is that financing through traditional public securities markets has been precluded in favour of alternative private capital sources, which include private closed-ended funds, private pension funds and specific partnerships, among others. This may imply some need for evolution on the public securitization of property investment and/or a search for a closer and more stable relationship between capital sources and operations.

2.5 A PERSPECTIVE FROM THE CONSTRUCTION SECTOR

Real Estate investment is closely connected with many other economic sectors, but especially with the construction industry in with what regards development projects, both public and private. This connection ranges from general infrastructures to

[27] The companies cited are *Sonae Sierra, Amorim Imobiliária* (now *Chamartín Imobiliaria*) and *Mundicenter*. Sources on activity indicators include *Vida Imobiliária (Nov2006)*, availiable in *www.vidaimobiliaria.com* , *Sonae Sierra External Valuation Report, Year End 2006*, availiable in *www.sonaesierra.com* and activity indicators, avaliable in *www.mundicenter.pt*.

buildings of the most varied functionalities, from offices to tourism, retail and many others.

The reality of the stagnation in the housing sector, after the end of the housing shortage in the late 1990's, has enhanced in the eyes of the construction industry the relevance of commercial property development, namely shopping centres or similar, office buildings, warehouses and industrial complexes. Also, the existing investment in housing projects is now placed on much higher standards of quality and diversification of supply than before and in many cases it includes institutional investors, stretching to the second home and tourism markets, including hotels, resorts and similar facilities/complexes. In any case, production has largely been affected within the change of paradigm and a long and significant recession is an unquestionable reality.

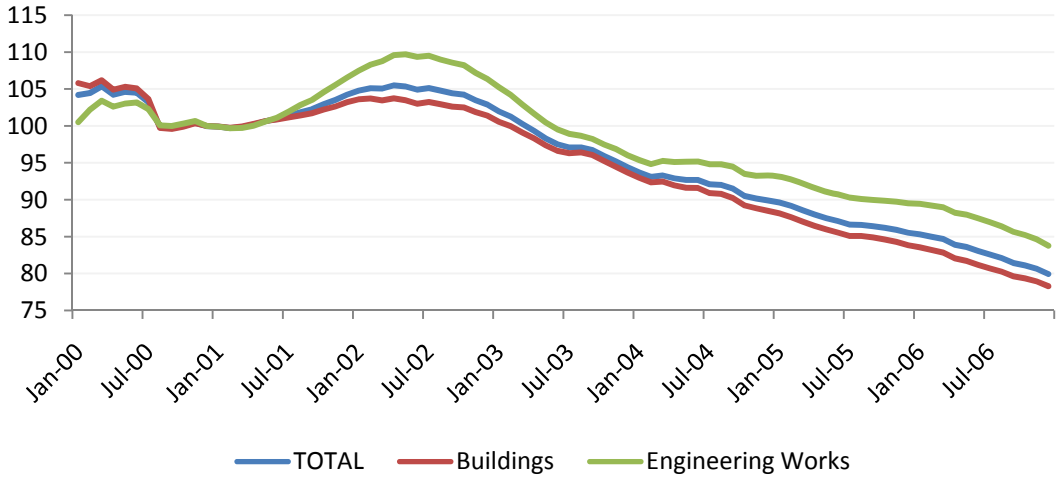
The growth of institutional investment in real estate improves the sophistication of professionals and practices, thus implying a more demanding environment in terms of the construction industry. A challenging environment is in the end a positive factor for development, despite potential negative perspectives, for several factors. Firstly, regarding building and infrastructure construction, facilities maintenance, refurbishments and other services, demand standards will naturally tend to be higher but there should be a natural correspondence in added value. This will include aspects like project management, construction management, quality and safety management, maintenance and technical assistance, surveying and others.

Secondly, this has to be considered an opportunity to qualify the offer of the industry and related services, by allowing that enhancement to serve as an extra aptitude to consider expansion of activity to other more competitive markets, or even just to survive in an ever more challenging one. Internationalization has been elected as a main

priority for a rather domestic construction industry, thus implying a huge effort, in which a growing and challenging real estate investment market can be a positive factor.

Figure 2-3– Production Index of the Construction Industry

This chart presents the evolution of the 12 month moving averages of 3 production indexes of construction industry, provided by the *Instituto Nacional de Estatística* (INE): the total industry index, the buildings' index and the engineering works index. Index base (100) refers to Jul 2000 and data covers the period through Jan2000 to Dec2006.



Lastly, a present reality in many construction groups is the vertical diversification through real estate promotion and investment, leveraging on specific know how and potentiating the primary industry. This also includes the participation or creation of real estate investment institutions like closed ended REIFs or other, as a vehicle for this investment.

2.6 CHALLENGES AND TRENDS

The real estate investment industry in Portugal is reaching the very early stages of maturity and consolidation. Real estate presently is a differentiating positive factor for attracting cross-border investment, for property owners, tenants or simple indirect

investors. Nonetheless, this potential is largely limited by the small size and specificity of the market, which has to be taken into account. In some sectors there is an excess of supply, while in others there is a lot of demand from investors with scarcity of quality product, thus impeding diversification. Future industry evolution has to stride the path of internationalization of operations, even if only in a European scope, as a natural evolution.

In terms of the attraction of investment, indirect vehicles, such as open-ended REIFs, will have to be able to further attract international capital, while internally being increasingly bound to compete with international indirect vehicles, like US REITs[28], or other, that are already available in the market through national financial intermediaries. Industry standards and regulations will tend to be harmonized at least within the EU in a short year span. Apart from the natural local factors related to property value and return, transparency will certainly be a key factor for attracting investors. In terms of asset allocation, pan-European direct or indirect investment is the natural option to enlarge the scope of opportunities.

Challenges to the national property investment market, to its players and professionals are substantial, and will imply the rising of competence levels, through adequate knowledge and information management. International emerging realities like property derivatives markets, globalization of the REIT framework and other developments within an ever increasing stream of property securitization, will dramatically change the concepts in which real estate investments are based, enlarging the range of possibilities, scope of investors and market players, in a word, competitiveness. The adequate and complete knowledge about the present reality of the industry, namely the quality of the

[28] See page 44 for a more detailed definition of the REIT concept.

available information and its sources, the characterization of the REIF industry, as the main indirect property investment vehicle, in a pure perspective of financial performance, and the perception of the level of sophistication in current professional practice is necessary to settle the mandatory specific evolution towards a successful development.

CHAPTER 3 - REVISION OF LITERATURE

3.1 INTRODUCTION

Real Estate is not just another asset class, it is special, singular. However, its unique features do not seem to diminish its mounting importance in a globalizing world within investment in a mixed asset context. Investment portfolio management is a global business and there is growing capital availability and interest in diversifying away from the main asset classes through property. Real estate asset allocation within the scope of the mixed asset portfolio and more specifically within the property portfolio is gradually a more important subject in the context of mature and transparent investment markets. The objective of inserting real estate within the theoretical and practical framework of general financial asset management, without letting go of its singular features, is not an easy one, but it has made great strides.

The birth of modern financial portfolio management theory dates back to the early third quarter of the twentieth century. Mainly derived from the research of several authors which developed models based on solid statistical concepts, it has been thoroughly tested over securities data and time series in the following decades. This may be explained in view of all the different economical, political and social aspects of the post-war world situation, namely the first steps of world trade globalization, the economic development of the United States (US) and the consequent rebirth of the generalized investor interest in securities exchange markets, now in an international perspective.

The seminal models of the 50's and 60's, from which Markowitz (1952) stands out, have set the theoretical grounds for a systematic analysis of financial markets, especially on the specific definitions around the nature of fundamental concepts like return and risk.

Markowitz (1952) establishes for the first time the return of an asset as a random variable with a normal distribution of probability, being its dispersion - standard deviation - the measure of associated investment risk. Based on this hypothesis, the risk adverse investor will seek in every situation to hold an efficient portfolio, which is the one that will provide the lowest possible risk for each given value of expected return, or alternatively the greatest return for a given level of risk. The set of efficient portfolios was named 'efficient frontier', and the choice of the optimal efficient portfolio depends in each case on the investor's adversity to risk. This model is currently referred in literature as Modern Portfolio Theory (MPT).

Despite its simplicity, this formulation establishes major concepts related to the characterization of portfolio return as a random variable dependent on the returns of individual constituent assets. In fact, one of its important conclusions is that the risk of the portfolio is not explained solely by the risk of individual assets considered independently but also, and to a large extent, by the correlation that exists between them. This is the founding idea behind the concept of diversification.

Only by diversification, e.g. by incorporating a large number of assets, preferably with low correlation between returns, is it possible to minimize risk without affecting expected return. This leads to the definition of concepts like specific risk and systematic risk as the parts that compose the total risk of investing in a financial asset. The first, specific risk, is the one that can be eliminated through diversification, while the second, the one that cannot be diversified away, is in fact the risk of the most diversified portfolio, the market portfolio.

Tobin (1958) extended the concept of efficient frontier to the incorporation of a risk free asset. By introducing this kind of asset in the portfolio, the efficient set becomes identical to all investors, independently of their own individual risk adversity. Any

investor will then possess the same portfolio of risky assets, the tangency portfolio, which will then be combined with riskless assets in a proportion adapted to his/her adversity to risk and utility measure.

In the situation of homogeneous expectations from all investors, being that all have access to the same information and the same capacity to determine the structure of the efficient portfolio, equilibrium considerations lead to the detention of a common portfolio for all, which is in fact the market portfolio.

Building on this basis, in particular on the nature of specific risk, work by Sharpe (1964) , Lintner (1965) and Mossin (1966) developed the Capital Asset Pricing Model (CAPM), which establishes market return as the single explanatory variable for individual asset returns.

This linear model is built on the beta parameter, as the coefficient of the explanatory or independent variable - market return. Beta measures statistically the relative tendency for the single asset return to covariate with the market return. Its simplicity and apparent universal application have boosted its popularity in the following decades, even beyond the scientific community.

Despite this reality, strong empirical and theoretical evidence started pointing towards the need of multivariable models for the explanation of asset return. Ross (1976) introduces the Arbitrage Pricing Theory (APT) , a multifactor linear model based on the concept of arbitrage, which includes several explanatory variables for asset performance, through several partial betas, each measuring the relative tendency for the asset return to covariate with each of the explanatory variables .

Both the CAPM and the APT are factorial models that do not integrate time variation of return, or, in other words, that assume asset and portfolio returns to be random variables with the same characteristics over time and independent of the specific period in study. These models then set expected return and risk as constant through time in a single

reference period and not dynamic or conditioned by external variables. Several other non-conditional factorial models were developed since then, being the two referred to above the most noted in literature.

Merton (1973) proposes a continuous performance evaluation model, the Intertemporal Capital Asset Pricing Model (ICAPM), which determines risk premiums that vary with time, depending on the market performance but also on other variables called state variables. Conditional models integrate several time-lagged explanatory variables, from which depend the characteristics of asset or portfolio return in a given period.

Empirically, overall superiority of any of these performance explanation models is yet to be demonstrated. Several studies discover the lack of fit of one model to some specific reality or time period, and others point out the adaptation of another model in particular conditions, such as explaining abnormal returns. Performance explanatory variables are still to be defined with unanimous acceptance, independently of the geographical or economical reality. Given the growing accessibility of powerful statistical analysis tools and the evolutions in econometric theory, research in this area has grown at considerable pace.

As the majority of performance evaluation models has been inspired, developed and tested over the reality of the securities market, especially the primary stock and bond markets, several of them have been adapted and extended to other asset classes including real estate.

The main reasons relating theoretical and empirical research to asset performance and securities market are quite obvious and are related to securities markets being a fundamental vehicle for corporate financing. They are public and transparent markets open to demand, where the systematization of processes, the existence of fast and seamless transactions leads to constant price formation.

Relevance of direct and indirect investment in property is growing[29]. The most important reasons behind this growth are the diversification potential that this asset class enables, the economic importance of the real estate and land development sectors and the growing securitization of real estate, which in turn enables indirect investment without specific specialization. Adding to these, the turning around on corporate real estate management strategies, by electing structural flexibility and availability for concentrating investment in their core business, rather than in property and assets, creates a new set of opportunities. All of these contribute to and benefit from the growing maturity and transparency of real property markets in general.

The extension of the application of performance models to this asset class became a solid reality in the 1980's decade, as a consequence of the sophistication of professional practice of sectorial agents in the US and UK markets (Cheng *et al.*, 2000 , Young *et al.*, 2002 and Lizieri *et al.*, 2001). One of the main reasons behind this was the beginning of systematic data series collection and production over property return, yields, vacancy rates and much other significant information. Performance models then started to have data to be used and tested. In spite of this, some relevant property markets in the global scene, like many in EU countries, still have significant data limitations (D'arcy *et al.*, 1998).

Some of the main related questions commonly asked by managers, investors and researchers are the definition of the optimal allocation to real estate in a mixed asset portfolio and also the optimal allocation within the real estate portfolio. Given the evolution and rising sophistication of practices in the securities markets, real estate professionals and agents found the need to address these questions supported on more

[29] References on this subject are numerous. See e.g. Batjelsmit *et al.* (1995), Byrne *et al.* (1995), Lynn (2007) and Laposa (2007).

solid ground. In a comparable approach to other asset classes, decision-making started to be based on performance analysis models and research over historical information, in order to rise up to the growing demands of a more sophisticated global market of institutional investors, namely for comparable performance measures for various asset classes.

The evolution in this field in the last three decades is very significant, both in a scientific and in an empirical perspective[30]. In the most mature markets, the existence of a property management specialized scientific community which interacts with the professional agents in an expressive way is a proof of this reality (Newell *et al.,* 2004).

Performance analysis of real estate assets and portfolios involves a large number of subjects, some that are essential to the problem, others accessories to it although relevant by nature. The objective of this chapter is to put in perspective the global state of the art in this field, focusing on the backgrounds of the research developed for this dissertation among the Portuguese market reality and presented in the subsequent chapters. Furthermore, given the almost absolute inexistence of academic property management research in Portugal, this review, in complement of Chapter 2, aims at providing literature references, at conveying a panorama of international research evolution, briefly at making available a starting point for future national based research, be it focused on the Portuguese property investment market or any other. In this way, there is quite a diversity of topics covered, but only the ones closely related to the work developed and presented in subsequent chapters are detailed to a greater extent.

Firstly, a review of the literature related to time series analysis of property indexes is presented, integrating all relevant aspects of index construction methodology, taking

[30] See Laposa (2007) and Lynn (2007) for reference.

into account this asset class specificity, the application of the most recent econometrical models and conclusions regarding the risk and return of underlying assets, segments and the overall market. This review relates to and provides the necessary background for the analysis of available Portuguese real estate market index time series developed in this work and presented in Chapters 4 and 5. The subjects of portfolio construction and optimization are also addressed. Issues reviewed in detail include segmentation according to explanatory return factors, which is discussed to a greater extent as a basis for the subsequent work presented in chapter 4. Also included are asset allocation, property selection, portfolio optimization and more especially overall performance analysis and portfolio evaluation with special emphasis to real estate investment funds, as a basis to the work developed and presented ahead. This overview ranges from the analysis of return distributions of individual property assets and portfolios, to the existence of predictability and performance persistence.

Finally, besides the review of literature in these fields regarding theoretical developments and model applications, relevant work available on the characterization of professional practice of property portfolio managers is also reviewed in order to establish its level of sophistication and the current application and use of related theoretical and applied research.

3.2 TIME SERIES ANALYSIS OF REAL ESTATE PERFORMANCE INDICES

Property return indices are the basis of any kind of performance analysis of the underlying asset. Two main categories of property indices may be distinguished: direct indices based on the returns of property assets and indirect indices reflecting the returns of real estate securities. Lizieri *et al.* (2000) connect this with the usual distinction between the private (or direct) and public (or indirect) real estate markets. The first

relates to real property (buildings) owned by investors and to the securities of firms or other institutions specialized in property investment.

Property indices are usually built on a series of total holding period returns (HPR) which reflect aggregately the types of information covered in an ideal commercial real estate index (Geltner and Ling, 2000): market asset prices, market asset activity, investment cash flows, market space prices (rents) and development industry information. Partial indices covering only some of these types of information (rent values, prices, vacancy rates among others) are more common and more accessible than total returns, especially through large broker firms or actuarial consultants. Nowadays, some property index providers supply partial indices of specific information and data for the same samples of property from which total return series are derived. In fact, this partial information and indices that relate to components of total return can be of a certain level of importance, especially the ones related to asset prices (Geltner and Ling, 2000).

Naturally, in asset allocation analysis at the portfolio level, when the manager does not control the timing of capital flows, time-weighted analysis of HPRs (e.g. time weighted average return) prevails over money-weighted perspectives like the one provided by the internal rate of return (IRR). This includes questions relating to volatility, systematic risk, correlations, lead/lag relationships, autocorrelations, forecasting issues and market efficiency. At property level multi-period performance attribution must be based on money-weighted rather than time-weighted returns. At the property level, even in an *ex-ante* perspective, the manager normally has substantial knowledge about the timing of capital flows that relate to the property (e.g., capital expenditure and operational income), thus justifying the use of a money-weighted perspective, sensitive to these cash flow movements.

The direct indices that reflect the total return of the direct market include income return and capital growth. They are obviously dependent on property values or prices. Their determination is mostly based on appraisals as a proxy for property value rather than actual market transaction values, due to the lack of sufficient available information (see e.g. Lizieri *et al.,* 2000, Brown *et al.,* 1996*,* among many others). Indirect indices are constructed over property-based securities, like stocks of real estate investment trusts[31] (REIT) or property investment companies, usually traded in public regulated markets, similarly to a common equity index.

Reviews on the general body of knowledge of property indices, including terminology, characteristics, history of development, construction methodology and availability can be found in Fisher *et al.* (1994), Gatzlaff *et al.* (1998) and Booth *et al.* (2003), among others. However, to our knowledge, the most exhaustive work on this subject to date is presented by Geltner *et al.* (2000) as a report prepared by the authors, at the request of the *Real Estate Research Institute* (RERI), on behalf of the *Pension Real Estate Association* (PREA), regarding the US private real estate investment industry reality and needs for indexing and benchmarking. This exhaustive work is divided in two parts: an executive report and a technical report. In the first, the authors summarize the principal lines of their work and the major conclusions are presented. Secondly, the technical report justifies the executive report and presents a very complete and detailed body of knowledge of property indices. Issues covered include definition of index types,

[31] REITs are corporations investing in real estate, either through properties or mortgages, with corporate income tax exemptions. The REIT structure was designed to provide a highly liquid method of investing in real estate. Like other corporations, REITs can be publicly or privately held, with public REIT securities selling like a stock on the major exchanges. The REIT framework currently exists in Australia, US, Canada, Hong Kong, Singapore, Malaysia, UK and several other countries, with others like Germany and India currently in a process of REIT introduction .

performance attribution, sampling procedures, valuation considerations, index reporting frequency, construction methodology and a review of some existing indices. Interestingly, the authors propose the existence of two separate families of asset class indices, each serving different purposes: asset class research indices and professional agent indices. This is justified by adding different specific needs to different technical demands and background, in order to define different specific sampling and construction methodologies for these two families. Therefore, asset class research indices, designed to be used by academic researchers, would be based mostly on the use of transaction price data and market rents rather than appraisal based values and proprietary information on income values. Its construction would be assured by the use of modern regression-based statistical techniques. On the other hand, professional agent indices which aim at supporting self-evaluation benchmark and performance attribution, must rely more heavily on proprietary information, like property-level appraisal and income data, contributed by a pool of subscribers and then aggregated to construct typical return indices for the market or partial indices for segments.

3.2.1 Direct Indices

The private real estate market's specificity imposes a hard task for the providers of direct indices, as the determination of returns is much more complex than in bond and equity markets. They need to collect proprietary information from institutional investors, which in many cases is considered confidential. Also the lack of universal definition of the market structure and of its agents emphasizes the role of segmentation as a basis for analysis and data collection.

The basic elements of total return are income return and capital growth. Both are relative measures, relating to the asset value at the start of the holding period.

Income returns originate from received rents net of direct and indirect costs assigned to the property, hence currently designated as net operating income. There is no unanimous list of eligible expenses or a unanimous methodology for its determination. Direct costs, which may include, the cost of rent collection, maintenance, insurance, repairs, professional service fees, property tax, utilities, among others, are easier to determine and more consensual. Indirect costs regarding management or other are more difficult to assign at the property level.

Assessment of return due to capital growth in real estate is not a simple problem due to specificity issues previously discussed. Rare transactions, long holding periods, illiquidity and asset heterogeneity prevent the market from being the actual marking agent and induce the usage of value estimates, most times based on appraisal.

Real Estate appraisal is in itself an autonomous technical and scientific area. Its development is led by recognized professional institutions of international scope[32] and also by the significant contribution of the academic community. Indeed, in the last twenty years, there has been a large deal of development and improvement effort in the quality of appraisals provided, both by the increase of available data and the sophistication of procedures. Primary causes for this development are strongly tied to the evolution of institutional investment in real estate, the sophistication of the market and the subsequent raising level of the demand for quality and reliability of appraisals . Concerning the state of the art of practice and research in Portugal, Bezelga *et al.* (2000) can be a valuable starting point. In fact, it is worth noticing that this is an area where Portugal has an effective professional and scientific community that is committed to its

[32] These include *The European Group of Valuers' Associations* (TEGoVA) and the *Royal Institution of Chartered Surveyors* (RICS) among others.

improvement, although in some sense following on the international main institutional practices and developments.

The appraisal process, despite its degree of sophistication and the quality of baseline information[33], induces uncertainty in value, thus in both components of the return. Valuations based on appraisal are then subject to random error, but in theory these errors should cancel out on aggregation. However, the appraisals may also be subject to bias, as methodologies are mostly based on the use of historical data and comparables[34] for assessing the value of a property. Valuation inertia, the difficulty for an appraiser to incorporate recent information, which is not "established" and not yet quantifiable for relevance, might be a too frequent problem of appraisal practice in a rapidly moving market. In this way, valuation-based indices suffer from a number of problems that are detailed ahead.

Despite the ample body of literature on handling these problems in order to recreate a series of valuation based indices that behaves as expected of the original transactions data, there are alternative methods of developing direct real estate indices based on the scarce real transaction data.

Repeat sales indices, considered by some authors as the ideal research property index (Geltner and Ling, 2000), are solely based on the transaction data from properties that are actually sold. In fact, securities market indices are repeat sales indices because securities are sold normally many times within each index calculation period. In this

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[33] Generally well established past information, that implies a certain lack of contemporary reflection of value reality and of the real factors behind it. Lizieri *et al.* (2000) suggest that appraisers use information over a time window preceding the date of the valuation and that they adjust prior valuations in the light of new evidence by an intuitive process of Bayesian adjustment.

[34] Most appraisal methodologies, simple or more complex, rely on market comparable data, from sale prices, to rents, yields or even construction costs of similar or relatable property/assets.

way the index can easily be based on the market prices of the securities transacted at the time at which it is calculated[35]. With sales based real estate indices the approach consists of building indices based on a sampling procedure for homogeneous segments, with different properties being sold each time. Problems that arise from infrequent transactions and heterogeneous samples require the use of econometric techniques such as the `repeat sales regression' (RSR) method and hedonic modelling and also some degree of subjective judgement.

Despite this reality, the fact is that, at present, the main commercial direct real estate indices in the UK, in the US, continental Europe, Canada, Australia and other prime markets are valuation based. The availability of long and consistent time series of direct property indices is a reality in mature markets like the US and the UK. A very large number of studies reflect this reality, but not many are exclusively focused in reporting on it. Lee *et al.* (2000), Booth *et al.* (2003) for the UK and Grissom *et al.* (1998), Geltner and Goetzmann (2000), Gatzlaff *et al.* (1998) and Geltner and Ling (2000) for the US are among the most significant.

Lee *et al*. (2000) report extensively on the performance of time series property indices available for the UK real estate market. Regarding the direct indices, this study identifies three sources of providers: individual real estate brokers like *Richard Ellis* and *Jones Lang LaSalle*, a specialized firm set up by agents and investors - the *Investment Property Databank* (IPD) - and, less relevantly, actuarial consulting firms. Data on direct real property return is available for this market from 1967 onwards.

The real estate brokers referred to are accounted by Lee *et al*. (2000) for the longest monthly, quarterly and annual appraisal based returns time series constructed on

[35] Market prices can be defined as “period closing” or “average period prices”, depending on the calculation method.

information from properties managed on behalf of their clients, but management and valuation services provided in exclusivity by the source organization are strong bias factors pointed out by the authors. The IPD database is the largest and most significant, although it does not cover such a long period as the other two, ranging only from 1985 to the present. In spite of this, its monthly series is referred to as only accounting for 10% of the institutional investment in real estate, including mostly property unit trusts, some insurance based real estate funds and some pooled pension funds. The quarterly and annual series are based on much larger property samples, thus being much more representative, rising up to 75% of the institutional property investment market when the yearly series is considered.

Lee *et al*. (2000) address the problem of database constitution and of its relationship with the structure of the market portfolio. Specialized databases, like the ones regarding monthly indices, due to the specific institutional context that 'enforces' monthly valuations and return measurement, potentially reflect only some specific segments of investors or property. Several other authors reinforce the concept that analysis on any kind of time series data regarding return on institutional property should always be developed with due consideration of sample structure and size as indicators of significance. Thus, again according to the authors, the IPD annual index is the series that can claim the best reflection of the UK institutional property investment market, also allowing for a large number of segmental indices. In fact, Andrew *et al.* (2003) refer the IPD annual index to be supported by the largest commercial property database currently available in the world, containing more than twelve thousand properties.

In Lee *et al*. (2000) the referred direct indices, regarding nominal and real returns in all frequency classes (monthly, quarterly and annual) are thoroughly analyzed, through descriptive statistics, trends, volatility, current and lagged correlations, autocorrelations

and seasonality tests, among others, providing a very complete and detailed picture of the available industry performance information.

Booth *et al.* (2003), report on almost the same time series but from an actuarial perspective, focusing on listing indices available, main characteristics and construction methods. The quantitative analysis is developed to establish stochastic investment modelling predictive nature from the available real estate data. The authors find it *"(…) reasonable to suggest that index construction in the U.S.A. is at roughly the same stage of development as in the U.K (…)",* an opinion that is not unanimous[36].

Likewise, Grissom *et al.* (1998) evaluate return time series data available in the US, given "the critical level of data poverty observed in real estate research over time" and relate several different sources and methodologies that seem, at first glance, to offer similar or parallel information. Despite this, data on property return in the US is available for an even longer time than in the UK, dating back to 1947. Several types of series are found in this study: return series based on ex-post evaluations of total return or yields, where price is determined by valuation or just from transactional data. Some of the series partially merge as they include information from the same sources in specific periods. Also listed are series based on ex-ante expectations of portfolio managers on property return.

Grissom *et al.* (1998) dissect each time series regarding database used and computation criteria, then establishing comparisons and relations, although in a much less profound degree than Lee *et al*. (2000). Simple trend analysis is carried out along with cross-correlation determination. Generally, just circumstantial links are found in specific periods, but series based on historic measures, like the Ibbotson&Associates series, the

[36] See e.g. Geltner and Ling (2000).

National Property Index (NPI) provided by the *National Council of Real Estate Investment Fiduciaries* (NCREIF), NREI[37] and RERC[38] are pointed out as being highly correlated, due to its similarity in nature and even by the fact of partially sharing data.

As extensively reported by Geltner and Ling (2000), Grissom *et al.* (1998) and others, the most used and quoted real estate return index time series for the US market is the NPI, which is developed by the NCREIF and consists of both equity and leveraged properties, but the leveraged properties are reported on an unleveraged basis. All properties are fully developed and investment-grade type, and are held by tax-exempt institutions in a fiduciary environment. Each property's market value is determined quarterly by real estate appraisal methodology, consistently applied and the index has the widest database available in the US, although still not universally accepted as a suitable benchmark (Young *et al.*, 2002) and slightly far from ideal according to Geltner and Ling (2000).

In other mature and transparent real estate markets like Canada, Australia, Singapore and Hong Kong, direct time series are available, being here again the main sources private firms like the IPD and/or collective industry associations similar to NCREIF.

Availability of direct property Indexes for continental European markets of EU countries is rather recent, being the main provider here again the IPD (or other private companies), either through local offices or in association with regional partners, being the latter collective industry associations or private firms[39]. Time series available are generally limited to annual returns, provided for the whole of the sample as a proxy for

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[37] NREI stands for *National Real Estate Investor*, a US company specialized in real estate information and news.

[38] RERC stands for *Real Estate Research Corporation,* a US company specialized in commercial real estate research, valuation and consulting.

[39] More information can be found in the IPD Index Guide (IPD, 2007a)

market performance and also for sectorial and regional segments. Periods of historical available data vary among countries, covering the last 15 years, at best. Reflecting on this, research on these markets is rather scarce and mostly due to professional firms, including among these the IPD itself, eventually associated with the academic community. Some work from the academic community in the UK and US focuses on investment internationalization in general, thus including at some level data on continental EU countries. This data consist mainly of indirect indices for property based securities, because they cover a larger time period and provide a more homogeneous data set regarding size and significance of sample and construction methods issues.

In Portugal, the only available direct property Index is provided by IPD/Imométrica and data is available since the year 2000. No evidence of significant academic research over this data was found, although this can be easily justifiable for reasons discussed in the next chapters.

Even in return time series based on a large diversified sample, like the IPD in the UK and the NCREIF in the US, other problems like survivorship bias are referred both by Lee *et al*. (2000) and Grissom *et al.* (1998). Changes in the data set over time may imply that only the best performing assets and portfolios are kept or survive within the institutional environment represented by the sample. This means a bias factor for performance evaluation for many authors,

On the other hand, many authors, like Lee *et al*. (2000), Baum *et al.* (2002), among others, find appraisal-based return series to show low volatility and high levels of autocorrelation due to related appraisal smoothing or lagging problems, especially those with short base periods (monthly and quarterly).

Appraisers are generally considered to under evaluate the extent of market change and to fail in accurately recording the timing of market movement. Literature around the

price discovery issue strongly points to the conclusion that market change in property securities provides a leading indicator of change in private markets. This leads, according to Matysiak (1995) , to appraisals being higher than prices when markets are falling, and lower than prices when markets are rising.

The issue of appraisal smoothing and its effects on return indices is addressed by several studies from Quan *et al*. (1991), to Baum *et al.* (2002) and Eldestein *et al.* (2006), among others. The tendency for appraisers to reflect heavily historic valuations on current appraisals, the inertia of appraisers to incorporate other market information that does not result from transaction or rent values of similar property and the high level of impact brought by new information that is necessary to change a valuation are realities generally accepted. The founding model by Quan *et al*. (1991) demonstrated that smoothed appraisals were a necessary consequence of a sparsely trading market. The authors express optimal market valuation as a weighted average of current estimated market price established through the selected valuation method and the previous appraisal. The weighting factor depends on longitudinal variance, which in fact is the quantity of market movement from the previous appraisal and cross-sectional variance, which in turn reflects a degree of uncertainty about the estimation of value through the selected method.

Recent studies like Baum *et al.* (2002) and Eldestein *et al.* (2006) show evidence of monthly valuation inertia in the UK and US markets and their influence on time return series. Given the "*little empirical investigation of how prices are formed in real estate markets and the role that appraisals may have in the price formation process*" Baum *et al.* (2002) suggest that rather than an actual problem, smoothing may be an actual characteristic of this specific market environment, due to the interdependency of appraisal and transaction prices in institutional real estate and the nature of the

transactional processes and sets a potential parallel with thinly traded capital markets. This idea seems to break the 'original' conceptual link between the primary securities market behaviour and the property market. One other conclusion of this study is that the shortening of the basic time period between valuations in order to make available more market information is worthless, unless appraisers do adequate collection of information and its interpretation. Obviously, this has a cost attached and investors should be willing to pay for it.

As a consequence of local and global appraisal bias discussion, the *Royal Institution of Chartered Surveyors* (RICS) in the UK have published the *Carsberg Committee Report* (RICS, 2002) and the following *RICS Reports on Valuation Accuracy* (from 2004 onwards). The significant conclusions from the *2005 RICS Report on Valuation Accuracy*, perceived from the analysis of a large sample of 1216 properties, are that *"in the UK market overall, the average difference between transaction price and valuations in 2003 was 9.9%"*; *"78% of valuations were within +/- 15% of sale prices"* and *"there is no systematic tendency towards under or over valuation in the previous ten years"*. For Portugal, on a similar basis but with a much less significant sample, IPD/Imométrica (2005) shows similar results in terms of valuation accuracy for predicting transaction prices as more sophisticated markets in the EU, like the UK, France and Sweden.

The understanding of the appraisal effect on performance measurement is of capital importance for property investment research, but it is not the only potential bias factor. The structure of appraisal providers, the client/appraiser relationship and agency costs are also significant issues according to several studies like Graff *et al.* (1997), among others, referring these also as potential bias factors. Despite this, property investment has its own specificity. The relative success of adaptation of performance models that

have been developed for liquid securities markets has not deviated from the aim of understanding the real nature of property investment. Separating the effects of bias factors from the specificity of property investment is then crucial, and it is encouraging to perceive that research is showing strong evidence of progress of in this direction.

3.2.2 Indirect Indices

As mentioned above, availability of indirect indices in general is greater than for direct indices, for obvious reasons. The main being that sources for indirect indices are property based securities, namely stocks from property investment companies and real estate investment funds, in most cases publicly traded on regulated markets. There are also some corporate or institutional vehicles that combine characteristics of both markets – real estate funds, for example – because their valuation is appraisal-based and hardly ever marked-to-market.

Price and return indices for public market real estate– indirect indices - can be obtained from standard securities data sources like DataStream, FTSE, among many others.

Lizieri *et al.* (2000) refer that despite the evidence of the distribution of indirect real estate returns being consistent with the stock market there is also evidence of close links between REITs and the underlying property market. This justifies relating REIT returns to property market performance because the performance of real estate securities is ultimately dependent upon it. Dividends and stock prices are in some level related to the net operating income from the property portfolio and of the increases of its capital values. However, this relation is not yet fully defined due to the differences in behaviour that persist even after correction for serial correlation in the direct market and gearing effects in the public market which in turn are justified by the fact that returns from valuation-based indices are an inadequate proxy of market performance.

Also included in the extensive analysis by Lee *et al.* (2000) are indirect indices, constructed from UK real estate based securities traded at the *London Stock Exchange* (LSE). Here, the *FTSE Real Estate* index (FTSERE), composed of property investment companies stocks, is analyzed, and comparison with the *FTSE All Share* index is especially worth noticing. Here, indirect indices, regarding nominal and real returns in all frequency classes (monthly, quarterly and annual) are also thoroughly analyzed, through descriptive statistics, trends, volatility, current and lagged correlations, autocorrelations and seasonality tests, among others, complementing the comprehensive and detailed picture of the available industry performance information.

The main US indirect indices are provided by the *National Association of Real Estate Investment Trusts* (NAREIT) time series, which reflect the return of REITs in consolidated terms for the general index and of specialized types or segments of REITS for the sector indices.

Work from the academic community in the UK and US (e.g. D'arcy *et al.,* 1998 Stevenson, 2000 and Lee and Devaney, 2004b) that focuses on investment internationalization in general, includes at some level data on continental EU countries. In some of these studies, the data used were indirect indices for property based securities, because they cover a larger time period and provide a more homogeneous data set regarding size and significance of sample and construction methods issues.

However, regional specificities exist, mostly due to local tax laws or regulatory issues. For instance, in Portugal, as there are no property investment companies quoted on the *Lisbon Euronext Stock Exchange* (LESE), the thriving industry of real estate investment funds, regulated by the *Comissão do Mercado de Valores Mobiliários*[40] (CMVM),

[40] The CMVM is the Portuguese Securities Market Commission. It was established in April 1991 with the task of supervising and regulating securities and other financial instruments markets, as well as the activity of all those who operate within those markets.

represents a large part of the Portuguese institutional property investment market, being the only indirect indices available for this market the ones derived from this industry and provided by the *Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios*[41]- (APFIPP). Detailed insight into these is provided in subsequent chapters. In other European countries many different specific realities can be found. However, in most cases there is usually one or more type of tax-exempt indirect vehicle of real estate investment, in order to create favourable conditions for the increase of institutional property investment, which is justified by social and economical reasons, regarding housing development, property market stability, urban land development, induction of national and international investment in a primary industry, induction of further transparency in the real estate industry, among many others.

3.3 PORTFOLIO CONSTRUCTION, OPTIMIZATION AND RETURN ANALYSIS

Portfolio construction aims at maximizing efficiency related to risk/return utility for the investor. According to literature (see e.g. Baum *et al.*, 1999) , property portfolio return analysis, like in general equity portfolios, depends on three essential factors: 'policy',

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Its range of supervision includes all types of real estate investment funds. The CMVM is an independent public institution, with administrative and financial autonomy.

[41] APFIPP - *Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios* is an association created to represent the interests of the Portuguese Asset Management Industry, including mutual funds, real estate funds, pension funds and asset management companies. Assets under management by Portuguese based APFIPP's Associates account for more than 90.000 million Euro (figures as of 30th September 2006 – source APFIPP- www.apfipp.pt).

'asset allocation' and 'stock selection', here more adequately designated as 'property selection'.

'Policy' refers to the risk/return benchmark that is used to measure and compare performance, defined according to utility perceptions, investment objectives and overall market environment. In this case, multiple approaches can be considered, from market models based on market portfolio return indices to indexes reflecting the return of specific regional or sectorial segments of property. This relates significantly to the previous section, more specifically to the structure, nature and construction method of available indexes, which define their ability to represent adequately the return of the market or of specific segments.

'Asset allocation', also referred to as 'structure' or 'timing' is the setting of portfolio weights to the specific market segments. Two fundamental stages of asset allocation in property investment research are commonly distinguished (Andrew *et al.,* 2003, Devaney, 2003, Lee, 1997, Lee and Lizieri, 1999 and Young *et al.,* 2002), among others): optimal real estate allocation in the mixed asset portfolio, and within the property specific portfolio between segments: retail, office, industrial etc.

Lee and Lizieri (1999) point out that this 'top-down' allocation strategy, although simpler in concept, and much popular in property research, is not consensual and can lead to 'sub-optimal' allocation due "to strong positive correlations between individual assets or sub-sectors across the asset class". Despite this, the 'top-down' allocation strategy is based on the existence of two main decision levels that are common to most of the institutional investment entities, mainly due to the level at which overall diversification strategies are defined and also to the need for management specialization of different asset types. Indeed, even the research of Lee and Lizieri (1999) based in the UK market, states that "*based on the monthly data from January 1987 to December*

1998, it can be concluded that, from the point of view of efficient diversification, little is lost by a two-stage investment process" .

'Stock selection', also referred to as 'property score', is the choice of individual assets within each market segment. This choice is dependent on the comparison between each asset's return and the average return for that market segment. As previously referred to, at property level, even in an *ex-ante* perspective, selection should be based on money-weighted rather than time-weighted returns.

The performance of portfolios is measured against specific market benchmarks, testing for abnormal returns. Performance evaluation is analysed through specific models that aim at characterizing and explaining asset and portfolio returns.

Besides trying to evaluate and forecast performance, it is important to determine if that performance is a totally random result or if it was induced by management skill. The quantification of the contribution of different functions and management skills to portfolio return is usually referred as 'Attribution Analysis'. It focuses on the quantification of the contribution of structure and stock selection components for a portfolio's relative return.

3.3.1 Segmentation

Asset Allocation procedures imply a structured and standardized segmentation framework based on statistical, practical and convention arguments, (Baum *et al.*, 1999). Thus, the correct segmentation framework implies that segments should be statistically significant at the return level, which implies a dimension that puts overall risk at systematic risk levels while maintaining a high return correlation between assets. Also, market data and information covering determining performance factors of

segments should be easily available and the investment community should commonly accept the asset class division, at least at a first and more general level.

A quite significant body of research in property allocation among the mixed asset portfolio is available for the US and UK markets (see for reference Brown *et al.*, 1996, Byrne *et al.*, 1995, among others), pointing to a sub optimal allocation to real estate mainly due to difficulty of attaining systematic risk levels due to property size problems, and lack of specific management skills and market experience. These are being slowly overcome by the growth of securitized real estate and indirect investment vehicles.

Segmentation research for property portfolio analysis is also reaching a quite consistent level. More specifically, the issue of levelling diversification factors across the segmental structure has been addressed by using the dummy variable approach (Heston *et al.*, 1994).

Fisher *et al.* (2000) decompose the returns of US real estate from the NCREIF database over the period 1978 to 1999 into 4 sectors and 4 regions. The average cross-correlation of the pure sector indices was found to be lower than the average cross-correlation of the regional effects.

Lee (2001) refers to regional and sector factors as the most relevant for explaining returns, based on empirical evidence taken from surveys on the diversification approaches of institutional investors such as Webb (1984), Louargand (1992), De Witt (1996) and Worzala *et al.* (1997). Based on data from the *IPD Key Centres Report* covering the period from 1981 to 1995, Lee (2001) used the total returns from 326 locations in multifactorial regression models to assess the influence of specific regional and sector factors in the return of segmental portfolios, concluding that "the sector

allocation is a much more important decision than the regional spread of the portfolio", because sector factors account for a much larger part of the variation in property return.

Newell *et al.* (2003) used data from Australian institutional property portfolios over the period 1995 to 2002 to test the significance of sector and geographical diversification in property. Here thought, regional effect proved to be slightly greater than the sector effect.

Devaney (2003) adds to the research on the UK market by testing explicitly the ability of standard property types and regions to define an effective portfolio structure. The authors use a cross-sectional approach on the data from the IPD UK Annual Index, confined to three main property types used for institutional investment and set other exclusion criteria to prevent bias on the analysis. Several segmentation frameworks were outlined and tested for significance with an analysis of variance test. This test was carried out on 200 equally weighted samples constructed from the database for each year. This prevented, according to the authors, bias factors introduced by uneven data sets.

In each year and for each segmentation structure being tested, a set of F-statistics was generated. The null hypothesis in each case was that the structure tested explains nothing about sample returns. The average for each set and its associated p-value were calculated. The p-value measured the probability of the null hypothesis having been rejected in error.

The results show that segmentation structures are only significant in some of the years, but, as the time period used increases, most of the structures become more successful in describing return differences. Conclusions indicate most of the structures to describe enough systematic patterns to be worth using. Regarding hierarchy of factors, type of property emerges again as more relevant than regional spread and the mixed and more

complex structures do not appear to be much better than simpler ones based on type alone.

Andrew *et al.* (2003) re-examine this issue by using again the large IPD annual database and more detailed classifications of sectors and regions than the simpler 3x3 or 4x4 scheme used in the previous studies hitherto referred, thus testing the impact of these finer classifications on the sector and regional effects. Several levels of detail in defining structure-region division frames are used, and different sub-periods are analysed. The authors find the sector-specific effect to have again a greater influence on property returns than regional factors, despite the changes in methodology and data. This impact of the sector effect is generally robust across different specifications of sectors and regions. Moreover, variations of this domination over the property cycle and the revelation of interesting sector and regional differences by the more refined sector and regional partitions are pointed.

These analyses on the importance of segmentation vectors for attaining diversification are heavily related to time series correlation analysis. In this field, Lee (2002) goes beyond the static or single period asset/market correlation. Based on Spurgin *et al.* (2000), he examines the change in correlation coefficients for several property segments using a quadratic market model. Thus, a dynamic model, based on the returns of the market index, provides the evolution of risk and presents a simple method of estimating the changes in an assets beta. The study concludes that market segments with significantly negative beta shifts display negative skewness and perform better in calmer periods of the market, thus contrasting with market segments showing significant positive beta shifts which display positive skewness and do better in volatile periods, especially during market downturns. Interestingly, the author finds the

explanatory power of the quadratic term to be small, leading to admit developments, which would incorporate other more relevant factors.

3.3.2 Portfolio Size and Diversification

Portfolio Size is another factor considered to be important in achieving diversification levels leading to the elimination of specific risk in property portfolios. Here, due to the individuality of each property, diversification factors may include specific characteristics like property size, tenant structure, lease terms, environment, age and many other, going down to the single property level. This implies a rather different approach than one would have regarding a securities portfolio. Portfolio size may have implications on the application of management skills and may impose restrictions on 'stock selection' especially when property size diversification is considered.

Larger funds typically hold properties of a larger size than small funds. Ziering *et al.* (1999) compared the performance of large and small properties in the US and concluded that performance was heavily related to size. Large size properties provide the highest returns in the long run but also display the greatest volatility (Ziering *et al.,* 1999), despite the common sense notion of being on average better located, attracting more creditworthy tenants and being accounted for as a status premium (Byrne *et al.,* 2001).

Byrne *et al.* (2001), for data covering the UK market from 1989 to 1999, find *"that large property portfolios cannot be classified as scaled-up versions of smaller portfolios"* and relate this to evidence of size being negatively related to specific risk but positively related to systematic risk, which in fact contradicts MPT[42]. This may be explained by differences in investment structure between small and large portfolios.

[42] *Modern Portfolio Theory* predicts that only specific risk is affected by portfolio size.

For the same market, but in an earlier and smaller period, Brown *et al.* (1996) conclude that market indices account for only 10% of the volatility in the returns of the average property, thus explaining the large number of properties (hundreds) needed to get down to market risk levels (systematic risk). In practice, this implies that effective diversification is very hard to achieve.

Lee and Byrne (1999) emphasize this idea by concluding that the number of properties needed in a portfolio to reduce the risk down to the market level is likely to be around 400-500. Accordingly, their opinion is that an individual investor or fund manager can have little confidence that their portfolio will display the same level of risk as the average portfolios suggested by advice contained in previous studies, especially at small sizes. Size alone does not necessarily lead to a reduction in portfolio risk and the impact of the market even on the highest aggregated portfolios is still low compared with the impact of a stock market index on equity portfolios. Clearly other factors are of greater importance.

3.3.3 Property Portfolio Optimization

One of the main vectors of research in the field of property management, portfolio optimization, is a central issue to academics and professionals. The mean-variance model of MPT has been quite central to these developments. Academic researchers have thoroughly tested its application and advantages in the general publicly traded investment market. There is a large body of research demonstrating the statistical diversification value of the use of MPT for commercial real estate in both mixed-asset and single-asset portfolios *(*see e.g., Mueller *et al.,* 2003).

Also in the institutional property investment market, real estate investors and professionals, including plan sponsors, consultants, managers and researchers, have also

recognized the value of incorporating these models in their investment decision-making practices (Coleman *et al.,* 2005, Pagliari *et al.,* 1995*;* Worzala *et al.,* 1997). According to Coleman *et al.* (2005), *"the use of quantitative asset allocation models in commercial real estate portfolios has risen sharply since the property markets in the United States experienced a significant downturn in the mid-1980s*". Interestingly, they point out distortionary tax laws that led to massive overbuilding as the main cause for the unprecedented crash of the US real estate markets in the 1980s.

The asset pricing models used to forecast the returns used in mean-variance optimization are based on significant hypotheses about market structure, pricing dynamics, the use and dispersion of pricing information and investor behaviour which are most fitted for highly liquid public securities markets. Commercial real estate generally assumed not to conform to many of the basic hypotheses underlying MPT.

The first and foremost is that asset returns should be normally distributed. Many researchers have found substantial evidence of non-compliance using a wide range of dataset and statistical procedures (e.g., Myer *et al.,* 1991,Young *et al.,* 1995, Brown *et al.,* 2000*,* Lizieri *et al.,* 2000, Coleman *et al.,* 2005, Young *et al.,* 2006).

The non-normality of real estate returns is generally not regarded as consequence of bias due to ‘‘appraisal smoothing’’ (e.g., Coleman *et al.,* 2005). The reverse engineering of applying a statistical model to ‘‘unsmooth’’ returns has the effect of increasing volatility by widening the distribution of returns, thus increasing variance. However, it will not, in most cases, transform a non-normal return distribution into a normal one, (Coleman *et al.,* 2005).

Despite this problem, there is a significant advantage in the regular use of such models as an aid to decision-making practices (see Cheng *et al.,* 2000*,* Young *et al.,* 2002*,* Lizieri *et al.,* 2000*,* Coleman *et al.,* 2005, among others). However violations of the

MPT assumptions should of course be identified and, if possible, adequately treated. Other structural problems like the need for correlation matrices to be positive definite are also connected to the verification of the basic assumptions of MPT (Ong *et al.*, 2000) namely the nature of return distribution and of its fundamental parameters. Practical issues also include non-linear optimization procedures as described by several authors like Byrne *et al.* (1997).

The non-normality of real estate data is not regarded as problematic as portfolio models need not be based on mean-variance analysis. Different specific alternative methodologies have been proposed by several authors discarding the normality assumption, in search of a better fit to the nature of real property return distribution. These alternative models are based on other dispersion measures as proxies for risk. These include, among others, Lower Partial Moments (LPM), and Mean Absolute Deviation (MAD). Examples of consistent application to real estate markets can be found in Byrne *et al.* (1997), Byrne *et al.* (2001), Lizieri *et al.,* (2000) and Coleman *et al.* (2005).

Non-normality is not an exclusivity of real estate. Following previous evidence on the securities market, Fama (1965) has verified empirically that return distribution of a given set would better fit a class of stable paretian distributions with a characteristic exponent between 1.7 e 1.9 instead of 2.0 as in the normal distribution. Based on these conclusions he proposed MAD as an alternative measure for dispersion of this type of return distribution, which was "ratified" subsequently by the academic and professional communities. With a considerable delay, such a quest was also introduced in the property investment scope of UK and US markets, both on property based securities and direct indices, as described consistently by Byrne *et al.* (1997).

Work by Myer *et al.* (1991) and Young *et al.* (1995) which found stable paretian distributions with a characteristic exponent of approximately 1.5 to be highly fit for a wide set of property indexes in several sample periods and sub periods, has led to putting MAD as an eligible dispersion measure for real estate return. Building on this, Byrne *et al.* (1997) point out the practical advantages of linear optimization, based on MAD as opposed to MPT and compare both models on quarterly NCREIF data from the first quarter of 1983 to the second quarter of 1994. Results present almost identical efficient frontiers by MAD and MPT, which is interesting, but is in any case explained by the characteristics of the data series used - although non-normal in nature, but in fact actually very close to it. Conclusions point out that MAD's major advantages are of practical/computational nature and it's use is should be also considered in situations where mean-variance optimization is not applicable.

Coleman *et al.* (2005), specify "their" definition of a desirable allocation model to include three basic characteristics: (1) to be conditionally predictive, meaning that it should de able to incorporate effects from current and future endogenous (e.g. traducing persistence, autocorrelations and other) and exogenous market factors; (2) to consider non-normal returns (3) to enable the introduction of investor risk tolerances and constraints over investment decisions. Though simple and obvious as it may seem, the formalization of this concept is of major importance to set forth the way for research on property asset allocation. Further than laying out the concept, the authors introduce an actual model in which the assumption of normally distributed returns is dropped. Instead property returns are assumed to follow a non-central Student-t distribution, using a newly developed Bayesian approach that permits to model and conditionally forecast property returns that are both skewed and leptokurtic. Considering that many investors are more concerned with negative return surprises than positive ones, the authors also evaluate a downside-risk allocation model that uses an asymmetric measure

of risk, semi-variance measured by the LPM, instead of a mean-variance optimizer. Conclusions point out that these are developments of work in progress, with a final aim of reaching a "tractable and more useful allocation model".

MPT optimization builds portfolios from historical data, thus assuring their *ex-post* efficiency. However the main purpose is to achieve in this way a portfolio that will be efficient in an ex-ante perspective, or at least that would outperform naïve or passive strategies. Lee and Stevenson (2000), consider the inter-temporal instability of the portfolio weights and the sharp deterioration in performance of the optimal portfolios outside the base sample period as the two "serious defects" to the classical approach to portfolio construction using MPT. Actually, the authors refer to the uncertainty of sample means as the main factor for this instability, rather than the estimation error in variances and covariances since these parameters are relatively stable over time.

In a rather extensive review of previous studies in portfolio construction, Lee and Stevenson (2000) note some other relevant findings. Firstly, that optimizing models "tend to produce portfolios with extreme holdings in a limited number of assets with some assets taking zero weights while others have very large allocations", which are referred to as corner solutions and considered by other authors as extremely unfit for adoption and against the spirit of diversification. Constraining asset weights are suggested by some authors as a solution to this problem, however compliance with such constraints in the property market can reveal itself to be a rather complicated task. Secondly, regarding the previous work on the application of MPT to the real estate portfolio by Myer *et al.* (1991), Mueller *et al.* (1995) and Pagliari *et al.* (1995), it is pointed out that MPT portfolios determined from ex-post data (a) may or may not be optimal during different ex-post sub-periods depending on the phases of the market cycle (b) may or may not outperform naive and market weight strategies in future

periods. Similar conclusions may be found in work by other authors like Cheng *et al.* (2000).

Lee and Stevenson (2000) test the effectiveness of ex-post optimisation in subsequent periods by forming efficient portfolios in a number of sub-periods and therefore holding portfolio weights into the next period, partially following Pagliari *et al.* (1995) but in a more limited and discrete version where only four ex-post portfolios are examined, parallel to Eun *et al.* (1988): the equal-weighted naïve portfolio, the minimum variance portfolio, the maximum Sharpe ratio portfolio or tangency portfolio (Tobin, 1958), and the Bayes-Stein shrinkage estimation. The use of Bayes-Stein estimators aims at reducing both the level of estimation error and the tendency for reaching corner solutions. Lee and Stevenson (2000) review this subject and present previous references of studies that find relevant evidence of significant improvement in ex-ante performance of optimal portfolios such as Stevenson (2001)[43].The Bayes-Stein methodology 'shrinks' the means of the assets towards a global mean which may be set through different criteria .

Lee and Stevenson (2000) derive the weights for each of the four portfolio strategies using a 24-month estimation period. The data used in this study are segmental monthly total returns over the period 1987:1 to 1998:12. A segmentation framework of three sectors: office, retail and industrial property and regions was used, following Eichholtz *et al.* (1995). Limiting the number of sector/regions is also justified so as to minimise optimisation errors with correlation matrices, as the number of observations used for each period was only 24 (see Ong *et al.* (2000) for details on necessary conditions for correlation matrixes in mean variance optimization). Results show that Bayes-Stein estimation and the minimum variance portfolio, despite having led to promising ex-ante

[43] Stevenson (2001) was previously presented at the 2000 American Real Estate Society Annual Meeting,.

results in capital markets, in this case are not efficient in improving out-of-sample performance. Cyclical nature of property is pointed out as the justification for these findings and also for the strong performance of the tangency portfolios in a short term *ex-ante* perspective.

Stevenson (2001) obtains different results with similar procedures, regarding monthly data from a sample of eleven countries' property securities indexes, covering 1976 to 1998 and incorporating the possibility of the introduction of transaction costs into the analysis. The use of the Bayes-Stein shrinkage does lead to increased stability and improved performance of the estimated allocations relatively to tangency portfolios (see also Stevenson, 2000). However, the true star for out-of-sample performance is the minimum variance portfolio, which comes in line with previous work for capital markets thus establishing once more the significant difference in nature between direct and indirect indices.

Again and following a similar methodology, Stevenson (2002a), examines the out of sample performance of REIT portfolios using direct NAREIT sectorial indices from January 1994 to March 2002. The author finds this analysis as significant regarding the industry of real estate mutual funds, due to its intense Equity REIT basis. However, it should be stressed that this is not a simple direct relation, due to the nature of REITs as an indirect investment vehicle, based on stocks traded in a public and regulated market. Results show a strong performance of the tangency portfolios in a short term ex-ante perspective which is somewhat in line with Lee and Stevenson (2000) and again in contradiction to evidence from the Capital Markets. The justifications for this are similar and related to the persistent nature and level of predictability of real estate, especially in the short term.

3.3.4 Predictability of Property Returns

The perspective of the conclusions in Lee and Stevenson (2000) and Stevenson (2002a) should be valued by its intrinsic drive for a real understanding of the specificity of property as a financial asset which naturally relates performance analysis to effects like cyclical nature, persistence of returns or autocorrelation.

A rather comprehensive review of literature on persistence of property returns can be found in Lee and Ward (2000) . The approach adopted in most of the research reported around this subject, independently of being developed over different data from direct and indirect property market indices, was the ranking of the return into quartiles (although other percentiles may be considered) and consequent statistical evidence of deviation from the 25% theoretical probability of remaining in the same quartile for the subsequent period, which would be then considered as an indicator of serial dependence in performance. Other possible methodologies for persistence analysis are: (1) cross-sectional regressions (Kahn *et al.,* 1995 and Silva, 2004) where future performance is regressed on the past performance ; (2) contingency tables (Kahn *et al.,* 1995, Malkiel, 1995, Lee, 2003 and Silva, 2004) that consist in a nonparametric approach in which indexes or other are classified as winners and losers over successive periods whether their performance is above or below the reference performance (usually the median performance), or some other. Through the analysis of contingency tables it is possible to test the frequency with which winners and losers repeat to find statistical evidence of performance persistence. In a way, this may be seen as a simpler version of the ranking methodology. Lee (2003) finds the use of contingency tables especially fit for studying real estate performance persistence due to its simplicity and lack of demanding initial assumptions on the returns distribution.

Evidence of serial persistence is rather consistent throughout different studies, both for direct and indirect property investment, although different in nature according to data period and type of market under evaluation (see Devaney *et al*.,2004, Lee and Ward, 2000, Stevenson, 2002b and Lee, 2003). Momentum and mean reversion research can also be found amongst a real estate context especially regarding property-based securities (Stevenson, 2002b). Some degree of market inefficiency could be the explanation for the existence of persistence in real estate returns and moreover that calculation of returns from appraisal based valuations, together with high search and transaction costs involved in the purchasing and selling of property would be highly influential factors in this condition of inefficiency. In this way, some authors like Young *et al.* (1995) and Graff *et al.* (1999) argue that the use and application in real estate markets of models that incorporate the assumption of independence in return distribution may be of questionable value to investors.

Cycles are a complex form of predictability as they preclude repeatability in time, thus being in nature different than simple trend effects (Pyhrr *et al.,* 2002). In fact cycles can enclose or exist in a complementary way of other trend effects like momentum and mean reversion. A systematic approach for a body of knowledge model in property cycle research can be found in Pyhrr *et al.* (2002). This paper covers the actual definition and distinguishing features of real estate cycles research, while developing a well-structured and comprehensive research framework and a classification model for related literature. Furthermore, the authors present a consistent and representative set of reference bibliography and propose a future research agenda for covering indicated gaps of knowledge.

Baum (2000) affirms that the concept of cycles is firmly embedded in European real estate and reviews the main advances in this area. The cyclic nature of property in the

mature market of the UK is analysed with an independent qualitative approach for the development, occupier and investment markets. Property development and rent cycles are highly linked with GDP growth and property market values. Some relationship is found between returns and the general business cycle, although less strong than the relationship between changes in capital values and economic growth. This is justified with the stationary nature of income across different periods.

Key *et al.* (1999) provide the fullest picture of long term UK performance available to date which is derived from various data sources. During the period covered, which ranges from 1921 to 1997 six completed cycles are found with 'recurrent but irregular' patterns that are not necessarily thought to be the result of a single cyclical process but rather the product of overlapping different length cycles.

Baum *et al.* (1999) find that neither rapid substitution nor a price-elastic supply response, as suggested by Key *et al.* (1999) for efficient space markets, is likely across European real estate markets. In this space providing industry, planning and permission time delays can vary significantly across markets to unsustainability as far as price adjustment efficiency is concerned. Another cause *can* be the "usual" way owners of space will restrict supply in an upswing. Baum *et al.* (1999) state that *"in an auto-correlated occupier/rental market, it is easy to see how letting at market rents may appear to be a sub-optimal financial decision, especially when the supply side is slow to respond to demand and price. Withholding space in this way exaggerates the supply shortage and the cyclical upswing."*. However this may not be as simple as it seems. The inertia of rents in a changing environment, potential vacancy costs, nature of property leases and other risk factors may not foresee this as such an obvious and universal option.

In the end, autocorrelation, valuation smoothing and sticky prices, adaptive behaviour by lenders and by developers (see Baum *et al.* , 1999) are strong indicators of inefficiency or irrationality in real estate investment decision-making. They have a direct and obvious correlation on the way space is developed, the way rents are agreed for space and the way prices are paid for real estate investments. Reactions are not instantaneous and the present reality is "sticky", thus exaggerating and elongating usual upturns and downturns of business and creating the appearance of actual cycles in real estate markets. Sticky prices affect occupier, investor and developer markets, elongating and exaggerating real estate cycles. Intermediaries, agents, transaction costs, re-locating costs, the large amounts of time, human effort and capital required to complete a project slow the rates of change in rental values, prices and vacancy rates.

Baum *et al.* (1999) point to dynamics of change due to several factors created by globalization and changes in the sources of property capital, broadening in origin, efficiency and in type, thus leading to dimmer and somewhat shorter cycles.

Despite this natural idea that the future global typical property market will accordingly be more efficient than present national markets, its real level of efficiency is yet rather uncertain.

3.3.5 Performance of Real Estate Investment Funds

Performance analysis and prediction of real estate investment funds is a specific subject within the larger theme of property return analysis. This specificity derives only from their nature as consolidated property portfolios, valued periodically on a NAV basis, with appraisals playing a major role, most unlike REITs that trade as marked-to-market stocks. In the end, the independence degree of the appraisal, the period between appraisal and the quality of appraisals are of paramount importance to the end results on

the funds return. This is defined according to a specific regulatory framework which varies from market to market.

REIF returns present much of the same characteristics commonly found in direct real estate returns: autocorrelation, serial persistence, low volatility, among others (Lee, 2003, Silva, 2005). These have already been reviewed before, also regarding valuation based indirect vehicles like REIFs.

However, the main problem behind REIFs is that a fund investing directly in real estate will not have daily market prices to determine value, which has to be established through appraisals (Redding, 2006). The use of outdated appraisals or the delays in valuation updating within the NAV calculation will lead to non-homogeneous arbitrage opportunities and to unintended wealth transfers between buyers, sellers, and long-term holders of fund shares. Bannier *et al.* (2007) present an overview and comparison between several international realities and regulatory frameworks of open-ended REIFs, including the Netherlands, Switzerland, Australia and Germany, pointing towards severe fragilities, mostly derived from valuation inefficiency and liquidity demands. As new fund units are continuously created or redeemed on demand and on a daily basis, at the prevailing net asset value, this configures a highly liquid investment. Problems arise both from the slow adjustment between the value of a fund's shares to changes in the market price of the underlying properties, due to typical appraisal smoothing and eventual additional lack of appraisal independence but also from redemption demands. In periods when the cash flow from real estate investments declines and prices deteriorate, unit redemption requests rise steeply. All together this has resulted in the discarding of this model and its substitution for a REIT type model, where creation or redemption of units is limited and nonexistent and shares are traded in general stock markets on a continuum basis.

Another relevant research topic regarding REIFs is performance evaluation, which is a natural extension of property portfolio attribution analysis. Relevant works naturally follow on from the methodologies used for equity and bond mutual funds. Unconditional models, from the classical Jensen models, which is based on the analysis of the linear regression of the excess return of the managed fund on the market index, to market timing models that separate performance components (see Lee, 1997, for a comprehensive review) have been largely used for this purpose, much with contradictory results, but also, more recently work using conditional models has also been developed for property fund performance evaluation (see Lee, 1999, O'Neal *et al.,* 2000, Lin *et al.,* 2004, among others).

3.4 REAL ESTATE PORTFOLIO MANAGEMENT

Real estate academic researchers have always been concerned in following closely the reality of property finance professional practice. Having a extensive knowledge of the sophistication level of property portfolio managers is considered a crucial factor for defining research strategies and measure the effect of academic advances on the practice and performance of property professionals. To some extent, in a progressive and sophisticated economic environment, academia and industry depend on each other. Research is justified, oriented and many times sponsored by institutional players that set goals of leading the industry in the development and implementation of best and innovative practices, as a mean to attain leadership in performance.

The body of knowledge of managerial behaviour in the US, UK and other related mature markets like Australia is developed essentially through survey-based studies among institutional investors.

Webb (1984) examines the analytical methods on which institutional investors such as Pension funds and Insurance companies base their acquisition and investment decisions. Louargand (1992) re-edits this type of research on Pension funds and thought results show a change from an accounting view on returns to a discounted cash flow perspective, a relative slow adoption of related models is reported. Furthermore, and showing no evolution from previous surveys, no evidence of the use of the basic techniques behind MPT is found at the strategic decision making level, although there can be found a reference to some of the basic concepts of diversification in the managers' lexicon. Interestingly, Louargand (1992) justifies the slow pace of adoption of these changes by the real estate investment community with two significant facts: first, that "*Many of the senior managers in the industry come from a 'deal-making' background*" with a diverse educational background that in many cases does not cover any glimpse of these modern financial techniques; secondly that in the 1980 the industry's players were too much concerned with acquisitions rather than with risk management. Relating these observations with present reality in less mature real estate investment markets, like the Portuguese one, is not very difficult.

Ziering *et al.* (1997), present the results of a survey conducted at the end of 1992 regarding the real estate research interests of the plan sponsor community. The major change in baseline conditions from previous studies was that the market was convalescing from the severe real estate recession of the early nineties and this fact should imply some impact on the credibility of the research community among the industry's players. Covering an universe of pension funds over half a billion dollars, the research issues found to be of paramount importance to managers are mainly around the role of real estate in a mixed-asset portfolio followed closely on diversification issues and performance measurement of real estate assets and portfolios, which is not surprising.

Batjelsmit *et al.* (1995) continue this path further by surveying a large number of pension fund managers regarding their decision-making framework. To some extent, in a relative perspective, conclusions report the same trend of reluctance to incorporate modern financial techniques in their property asset allocation procedures as found in Louargand (1992), although with significant positive change. The results show that only one-third of the respondents did use any quantitative method for the support of within property asset allocation decisions. However, the degree of refinement ramps up when assessing the mixed asset portfolio, in which 60% admitted the regular use of MPT. Immediate justification can be related to lack of real estate specialization. When complementing this with fund size analysis, with the average fund allocation to property (4,4% in the US) and the outsourcing of property portfolio management, a well established obvious causal relation can be established – a pension fund is not a "real estate only" investment institution – and in fact results should be looked on from a different perspective.

Farragher *et al.* (1996), extends this type of research to a wider set of investors, including plan sponsors, REIT's, private investment companies and insurance companies. The objective of this research was to assess the overall sophistication of the property investment decision making process, from beginning to end, not just covering asset allocation or property acquisition stages, but also strategy definition, return forecasting, risk assessment, investment evaluation, performance benchmarking and post auditing. Here results are more in line with an established sophistication of managerial practice, which is not contradictory to previous research, given the difference of the population under study and the natural evolution of the industry.

Looking over the importance of results and focusing on surveying procedures, it is worth noticing that in all the previous surveys, enquiries were mailed to an extensive

population of hundreds of organizations, which exists due to the inherent size of the market. Response rates were in general around 30%, and statistical significance of the sample is acceptable. Reference to problems in developing this type of survey in small markets can be found in De Witt (1996) and Vasques *et al.* (2005), pointing out the use of personal interviews in these cases.

Surveying such a small target population precludes traditional mailing procedures, like the ones used by Farragher *et al.* (1996) (to the universe of the largest property investors of the United States) or Ziering *et al.* (1997) (to the universe of the US pension funds) which are not usable here. In fact, for a reduced population (less than 50), the need s for sample size tend to equal the population in number. Mailing enquiries is therefore not adequate because it would certainly lead to a final set of returned information of not more than 30% of the population, which would not be acceptable for this particular case.

In fact, Farragher *et al.* (1996) suggest that even if there was a greater percentage of answers returned, two other factors could compromise the credibility of the study – the respondents being biased or non-informed. As for response bias, companies with more sophisticated practices can be more willing to respond than the less sophisticated ones. Regarding non-informed respondents, any uncertainty on the level of responsibility of the respondents in their organization can compromise the acceptance of collected data. Those authors suggest simple tests for bias and non-informed respondents, proving adequate for a larger population.

Personal interviews allow for clarification of questions if the respondent experiences any confusion on the subject matter, which is almost impossible with mail questionnaires (De Witt, 1996). However, in face-to-face interaction, special caution is

due so as not to influence the respondents' answers. On the other hand, questionnaire response procedures may imply lack of spontaneity and potential of bias in responses.

De Witt (1996) studies the managerial practices of Dutch real estate institutional investors by surveying a relatively large sample of forty pension funds and insurance companies and concludes that most Dutch investors actually diversify their real estate portfolio, based essentially on property type or location. Dutch investors were also found not to rely on actualizing cash flows but instead using simple income capitalization methods, not concerned with risk adjustment when evaluating real estate returns. The high allocation to real estate of 15% on average is justified on an historical perspective of Dutch investors regarding the real estate inflation-hedging ability and surprisingly, at the time, Dutch investors admit that they did not, ex-post, measure real estate's performance, something that is bound to have changed from two decades ago.

Recent and comprehensive work by Newell *et al.* (2004) reports on the attention given in the US for the last ten to fifteen years to the industry's needs and priorities for research, mostly funded by leading investors associations. Evolving from here to an international perspective, Newell *et al.* (2004) compares the results of four recent major international real estate surveys to examine the real estate research priorities of real estate fund managers in the US, UK, Australia and Germany. These four surveys were conducted over 2000–2003 and all included twelve general common real estate research topics and twenty-seven common specific real estate research topics analysed using Principal Component Analysis (PCA), a multivariate analysis technique in which a small number of the underlying dimensions in the survey are extracted to explain a significant proportion of the total variation. The authors find these surveys to have clearly identified the general and specific real estate research priorities for real estate fund managers in these four countries. The role of real estate in a mixed-asset portfolio

and real estate and portfolio risk management are held amongst the general real estate research priorities. Interestingly, there is found a much closer alignment of the real estate research priorities in the UK, Australia and Germany than in the US.

3.5 CONCLUSIONS

In this chapter we have provided an overview of the global state of the art on real estate investment analysis, focusing in more detail on the backgrounds of the present research.

Firstly, the discussion developed around the subject of time series analysis of property indexes integrated all relevant aspects of index construction methodology, taking into account this asset class specificity, the application of the most recent econometrical models. It enabled the conclusions regarding the commonly accepted existence of smoothing and lack of serial independence in appraisal based indices, which condition the return distribution of underlying assets, segments and the overall market to be hardly close to the normal distribution. This relates heavily to the analysis of direct and indirect Portuguese real estate market index time series presented in Chapters 4 and 5.

Portfolio construction and optimization are processes based on predefined market structures – segmentation, which are created according to explanatory return factors. The revision of research on the analysis of segmentation structures and their impact on asset or portfolio is further developed within the subsequent work presented in Chapter 4.

In the present chapter, it has been extensively evidenced that asset allocation, property selection, portfolio optimization procedures should be based on sound hypothesis and proven predictive models. Departing from the research reviewed here, regarding the knowledge on the return distributions of individual property assets and portfolios and to

the existence of predictability factors and behavioural features, like specific performance persistence, in Chapter 5 we present a detailed research on the returns of the only type of public indirect property investment vehicle in the Portuguese market, REIFs. Moreover, due to the specificities of their regulatory framework also extensively described and justified, REIF performance analysis presents special challenges and difficulties, which will be described in complete detail later.

Besides the issues around quantitative performance, the detailed discussion on the previous research regarding the characterization of the professional practice of property portfolio managers, especially in terms of asset allocation and property selection, has provided a proper background for the study presented in Chapter 6, which aims at establishing the level of sophistication of property portfolio managers in the Portuguese Market, as a proxy for the sophistication of professionals in an aggregate perspective.

Finally, the evidence offered along the present chapter of an absolute contrast between the virtual inexistence of academic property management research in Portugal and the global reality, may provide with basis and reference for future national-based research.

CHAPTER 4 - THE PORTUGUESE DIRECT REAL ESTATE PERFORMANCE INDICES – AN ANALYSIS OF SEGMENTATION STRUCTURES IN AN IBERIAN CONTEXT

4.1 INTRODUCTION

Data collection and publication regarding performance of commercial property assets in Portugal is a recent activity, in line with the perception of a yet semi-mature nature of this young market (D'arcy et al., 1998, Jones Lang LaSalle, 2006a, Cushman&Wakefield, 2006).

In the early 1990's, data on property prices, rent values, supply per segment, potential demand and vacancy rates began to be systematically collected and correspondent indices published by research departments of real estate brokers, asset managers and investment advisors. This deployment was impelled by a significant development of the office and retail markets, mainly in the metropolitan areas of Lisbon and Porto, with a significant rise in supply of newly developed buildings. However, the common perception regarding the consistency of construction methods, reliability of data sources and significance of the samples used is largely heterogeneous. This relates to the appearance of a neophyte professional community that aimed at catching the opportunity created by a thriving but immature market, which in turn was searching for information to support investment decisions. Adding to this was the fact that international investment was making its appearance in the national arena, which provided quite favourable ground for the settlement of international brokers and consultancy firms, setting the basis for greater competition and further developments on the sophistication of professional practices.

Partial indices, regarding property prices, rents, yields, supply, potential demand and vacancy rates per segment, can today be obtained today from numerous sources. Among them are prime property brokers, specialized information providers, financial institutions and even professional or sector associations.

More recent is the availability of consistent data on total returns of direct property investment. As sole supplier of investment property return data in the Portuguese market, IPD/Imométrica started its activity in 2000, and one year later it also started operating in Spain. IPD/Imométrica provides annual market and segment indices which only include commercial property standing investments, excluding also non-market properties, indirect holdings, transactions and developments. These are based on annual properties valuation within a representative sample and constructed with a sound and proven methodology which in fact is also a standard for many other more significant and mature markets (Geltner and Ling, 2000 and IPD, 2007a).

Nonetheless, these indexes have still a rather limited period count, which makes any kind of time series analysis statistically inconclusive. Hence, very scarce research over them can be found, namely aiming to serve performance prediction, explanation and allocation models. The only traceable research has been developed within the provider's organization or within a joint partner research[44]. These have instead taken a cross sectional approach, provided with the fact that data on individual properties was available, due to the high degree of involvement of the IPD.

In this study, given the latter difficulty, the central target was set on the baseline examination of the existing data regarding performance of the direct real estate investment market for prediction and allocation purposes. More specifically, the objectives established were to provide a detailed characterization of the indexes covering sources, base sample and construction methods and especially an examination of the effectiveness of the segmentation structures used. To date, to the author's

[44]This refers to the IPD/Imométrica (2005) studies on valuation accuracy in Portugal and with the research by Lee and Devaney (2004b) that aimed at defining investment strategies within a pan-European scope.

knowledge, and as in most other related issues, there is absolutely no research on the relevance of the segmentations structures commonly used in the Portuguese or Iberian Markets.

In order to maximize results, investors are expected to use a structured approach to portfolio construction and management, which should be heavily conditioned by the structure of the available information, or in other words on common definitions of market segments. According to Devaney (2003) these tend to reflect the different systematic drivers of performance or the differing sensitivity of assets to those drivers. Evidence reveals that in real estate investment, high levels of specific risk are to be expected and systematic influence of segments on returns may not be as significant as in other asset classes (Mueller *et al.,* 1995, Lee and Byrne, 1999, Byrne *et al.,* 2001). This raises the question of whether if any specific segment structure reflects enough of the systematic influences for their use in portfolio construction to be worthwhile.

In this study, the segment structure that is used by the IPD/Imométrica, as the only current provider of return data on direct property, is evaluated. The ability of segments to explain market returns is tested against a null hypothesis of no explanatory power. As segments are defined to group properties that perform in a common way, it is expected that they will explain a significant amount of their returns. Specifically regarding segmentation structure, despite the main scope of this study being the Portuguese market, in this case the consideration of an enlarged scope that included also the Spanish market came as a natural extension due to the similarity of the index structures, some aspects of their recent history, and also to the proximity of the two countries and the very strong economical and social ties.

This Chapter is organized as follows: first there is an initial general characterization of the available performance data, covering sources, base sample and construction methods

which cover the first part of the objective above described; secondly, there is a detailed presentation of the analysis methodology developed for the analysis of the segment structures behind the IPD indexes. Next, results of the analysis are thoroughly presented and noticeable empirical evidence on the relevant segment structures is identified. Finally, there is an examination and discussion of results.

4.2 DIRECT PROPERTY MARKET INDEXES – AN OVERVIEW

Established in 2000 as a representation of the reference UK property information provider, rather in a parallel way as occurred in other European and international markets, IPD/Imométrica is the only systematic and consistent source of return data on the Portuguese direct commercial property market. Hence its appearance has somewhat stirred the market and changed the status quo of information availability. In the Spanish market, activity began in 2001.

As of December 2006, the IPD/Imométrica Portuguese index was built on a sample of circa 7800 million Euros, which would account for about 53% of the institutional property investment market, representing a large acceptance of this initiative and of the baseline concepts behind it[45]. The same kind of market representation is accounted for in the Spanish index, a total base sample of 15500 million Euros.

IPD/Imométrica works with their clients on information-and-fees per information-and-services trade-off. The clients pay an annual fee, which is dependent on their actual portfolio size, and provide extensive information on all properties held within their

[45] Source: IPD (2007a).

investment portfolios[46], namely: a building description and ownership record, covering location, type of property, size, date and cost of acquisition; an annual financial record, logging all capital and revenue flows attributable to the property; tenancy level information. This allows IPD to build a comprehensive and largely representative databank, from which they develop aggregate and sector market indices and reports that are consistent measures of investment return and market performance. These are provided first-hand to their clients who are databank contributors. Together with this, they provide their clients with a comprehensive performance benchmark analysis developed against their rather representative sample of the market and its sectors. Nonetheless, IPD also provides information, reports and services to non contributors, within different conditions.

Generally, the market segmentation used for Portugal and Spain is specified in Table 4-1. For both countries it is primarily developed on a sector basis, with a secondary level of segmentation that refers to geographical distribution in the case of the office sector and to size/scope in the case of the retail sector (mostly relating to shopping centres or retail parks).

The IPD indexes in Portugal and Spain are annual indices which only include commercial property standing investments, also excluding non-market properties, indirect holdings, transactions and developments.

Market indices are therefore based on annual properties valuation, as at December, which are referenced to the open market. The majority of these properties is valued externally, using mostly the income approach and comparison methods. The

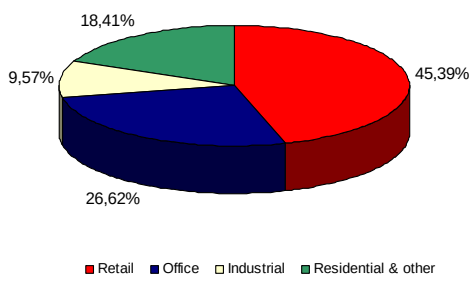
[46] This includes a building description and ownership record, covering location, type of property, size, date and cost of acquisition; an annual financial record, logging all capital and revenue flows attributable to the property; tenancy level information and other according to IPD (2007a)

construction of the Portuguese and Spanish indexes is done in accordance with principles and methodologies used in all countries where IPD is present (see IPD, 2007a). This allows valid international comparisons of property performance measurement and the construction of aggregate indices.

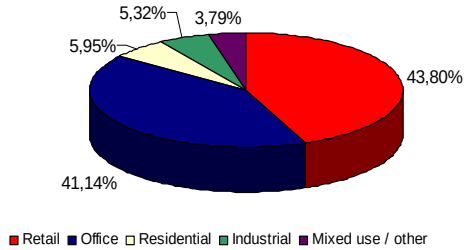
Table 4-1- IPD Portuguese and Spanish Indexes – Segmentation

This Table presents the Segmentation Structure used for the IPD Portuguese and Spanish Indexes. Pie Charts indicate sector representation as of end 2005 (source IPD, 2007a).

Portugal Segmentation	
Main Segmentation	Secondary Segmentation
Type of Property	Regional Spread/Size
Retail	Regional shopping centres
	Sub-Regional shopping centres
	Other shopping centres
	Other retail
Office	Lisbon Offices: CBD
	Lisbon Offices: New office areas
	Lisbon Offices: Other areas
	Porto Offices
	Rest of Portugal
Industrial	General/no Segmentation
Residential & other	General/ no Segmentation



Spain Segmentation	
Main Segmentation	Secondary Segmentation
Type of Property	Regional Spread/Size
Retail	Large shopping centres
	Medium shopping centres
	Small shopping centres
	Other retail
Office	Madrid CBD & Other Central
	Madrid Other
	Barcelona Prime/CBD
	Barcelona Other
Residential	General/no Segmentation
Industrial	General/no Segmentation
Mixed use / other	General/ no Segmentation



IPD indexes and reports partial return parameters like capital growth, income return, gross and net initial yields and other directly related, such as operating costs and rental value growth. Annual total returns, defined as the classic sum of capital growth and

income return, are tentatively money-weighted (see IPD, 2007a) as transactions are timed to the month of completion and other capital expenditure timed to the mid-point of the year. Income is assumed to accrue on a daily basis and is weighted to the mid-point of the year to approximate a pattern of continuous reinvestment.

4.3 DATA AND METHODOLOGY

The analysis takes a cross-sectional approach, focusing on return variation. However, due to the characteristics of the available dataset the data used were not individual returns but rather subclass annual returns. This indirect approach is similar to the one used by Lee (2001) and assumes that these classes are representative of individual property returns. The reference period was the whole five years of available data that is contained in the 2005 IPD Iberian Digest. In the reference period, returns will vary across properties, hence across property subclasses, due to both systematic and specific influences. The aim is to find the general segmentations that best reflect the systematic patterns in the data and so which define general groups of properties with similar return characteristics.

The segmentations tested derive naturally from the IPD index structure. Two different analysis scopes were considered: the Portuguese market alone and the Iberian Market as a whole. Regarding the first, the general segmentation structure tested was based on the property sector, regarding only the two main sectors of activity in the institutional market: retail and office. Departing from this, a sub-sector analysis was developed for both retail and office within the Portuguese market, to test for significance of secondary segmentation. For the Iberian market the analysis developed considering two main segmentation variables: sector and location. Within this baseline, several one and two dimensional structures were tested for significance, according to Table 4-2 and 4-3.

Table 4-2 –Segmentation Structures - Portuguese Market

This Table presents the Segmentation Structures tested for the Portuguese Market, based on the segmentation used by the IPD in Portugal. For each structure, the segments considered and the data points available for the period of 2000-2005 are indicated.

Structure	*Scope*	*Dimensions*	*Segments (data points avaliable)*
PTS	Portugal Whole market	Sector	Office (25) Retail (20) Industrial (5)
POS	Portugal Office Market	Sub- Sector (Location)	Lisbon Offices: CBD (5) Lisbon Offices: New office areas (5) Lisbon Offices: Other areas (5) Porto Offices (5) Rest of Portugal (5)
PRS	Portugal Retail Market	Sub- Sector (Size and other)	Regional shopping centres (5) Sub-Regional shopping centres (5) Other shopping centres (5) Other retail (5)

Each of the six segmentation structures was tested for significance regarding total returns, capital returns and income returns, thus resulting in 6x3 different analyses. The consideration and differentiation of the analysis for return components is found to be rather important, despite being apparently disregarded in related literature. In fact, the two basic components of return are often differently regarded by portfolio managers, because they are considered to be different in nature: income return is tangible and objective as it is and capital return has a more subjective or potential nature. In many cases, portfolio decisions are made exclusively regarding only one of these components, or valuing one over the other.

Table 4-3 - Segmentation Structures - Iberian Market

This Table presents the Segmentation Structures tested for the Iberian Market, based on the segmentation used by the IPD in Portugal and Spain. For each structure, the segments considered and the data points available for the period of 2000-2005 are indicated.

Structure	*Scope*	*Dimensions*	*Segments (data points avaliable)*
ITSL	Iberian Whole market	Sector and Location	Portugal Office (16), Portugal Retail (16) Spain Office(16), Spain Retail(16)
ITL	Iberian Whole market	Location	Portugal (55), Spain (43)
ITS	Iberian Whole market	Sector	Office (41) ; Retail (35)

On each of these samples, an analysis of variance test was then carried out. The analysis of variance (ANOVA) is a procedure that allows the comparison of parameters of two or more populations. It is based on the calculation of the amount of dispersion in the sample that is explained by one or more particular factor(s), in this case dimensions of the segmentation under study. Different ANOVA models exist for different cases and base hypothesis. In this research two different models were used: the single factor ANOVA for the structures under study which considered only one segmentation dimension, and the two factor ANOVA for the two dimensional analysis of the ITSL structure.

In the single factor model, considering fixed effects, all the possible conditions of the factor under study are sampled, grouped and tested, and are supposed to affect only the mean of the underlying normal distribution of the "response variable" (Guimarães *et al.*, 1997) . In the present case, the factor is the segment to which the property belongs to and the “response variable” is its return. The model can be expressed by equation (4-1):

$$X_{ij} = \mu_i + E_{ij} = \mu + \alpha_i + E_{ij} \qquad \textbf{(4-1)}$$

where i is the index that refers the group of observations for which the factor remains constant, j the index that refers each observation within the group, X_{ij} the j^{th} observation of group i , μ_i is the expected value of group i , μ is a global fixed parameter, α_i is the specific parameter of group i and E_{ij} is the associated error term.

The null hypothesis under test is that the structure being tested explains nothing about sample returns, which corresponds to equality of group averages. It is expected that this null will be rejected if the structure defines underlying systematic influences on property or more specifically if the group averages are significantly different in a statistic sense. The statistical significance of that explanation is measured by the F-statistic generated for each structure being tested, and its associated p-value, which measures the probability that the null hypothesis has been rejected in error.

The two factor ANOVA, used for the two dimensional analysis of the ITSL structure, is in nature an extension of the one-way methodology. It is expressed by equation (4-2) for two non- additive effects:

$$X_{ijk}=\mu_{ij} + E_{ijk} = \mu + \alpha_i + \beta_j + E_{ijk} \quad \textbf{(4-2)}$$

where i is the index that refers the group of observations for which the factor A remains constant, j the index that refers the group of observations for which the factor B remains constant, and k the index that refers each observation within a combined factor group, X_{ijk} the k^{th} observation of group ij , μ_{ij} is the expected value of group ij , μ is a global fixed parameter, α_i is the specific parameter of group i ; β_j is the specific parameter of group j and E_{ikj} is the associated error term. In this case, three different tests are in order: one test regarding the influence of each factor and a third one regarding interaction effects between segmentation variables. The null hypothesis under

test is that the effect/dimension being tested is null. The statistical significance of that explanation is also measured by the F-statistic generated for each effect being tested, and its associated p-value, which measures the probability that the null hypothesis has been rejected in error.

Basic assumption for the use of both models include the independence and normality of returns, but also the equal variance among the groups, in this case the segments included in the structure under analysis.

4.4 RESULTS

Results obtained are presented in Table 4-4 to 4-6. Each table includes the test statistic for the structure tested and the respective p-value for total, capital and income returns. ANOVA tables are presented in further detail in detail in annex.

Regarding the Portuguese segmentation structures, the most noticeable fact is that the general sector segmentation is generally significant as a factor of return explanation for the five year period under analysis. This result is in line with other evidence from European countries. When going into further detail, sub-segment structures based on size and or geographical distribution appear to be less relevant for explaining returns, especially regarding the office sector. Despite appearing to be tentative evidence of a larger influence the segment structures in income return, this difference between the effects on total returns and its components is indeed not relevant, except in the case of PRS. Nonetheless, all the evidence presented for sub-sector structures may only be found suggestive due to the small size of the available samples.

Results for the Iberian market structures are in line with the results for the Portuguese structures, and also with previous research in other markets, like the UK. In this case,

through a two-dimensional analysis, both the sector and location dimensions are tested, and also the interaction between these two variables. Again the Sector is the main factor for return differentiation, now even in more significant terms. The strong interaction effect verified is relevant across all dependant variables, which may lead to the suggestion that the two effects are not additive or independent. In any case, it is not at all clear from the analysis of Table 4-5 the actual meaning of this interaction.

Table 4-4 - Significance of Portuguese Market Segmentation Structures – Results

This Table presents the results for the one-way ANOVA tests on the PTS, POS and PRS segmentation structures, for total return and its components. Statistics in bold marked *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively**.**

Structure	*Dimensions*	*Total Return*		*Capital Return*		*Income Return*	
		F-stat	p-value	F-stat	p-value	F-stat	p-value
PTS	Sector	3,538	**0,037****	2,253	0,116	3,068	**0,056***
POS	Sub- Sector	1,694	0,191	1,474	0,248	1,806	0,167
PRS	Sub- Sector	2,701	**0,080***	3,607	**0,037****	0,171	0,914

The one way analysis on the ITL and ITS structures, which include a larger base sample, corroborate the two-dimensional analysis results (Table 4-6). Sector is overall significant and Location is only a significantly relevant factor for income return. In fact, income returns appear again to be more influenced by segmentation factors, which may be explained by strong structural differences in yields across the segment structures and also by the more volatile (and subjective) nature of capital gains. As previously referred to in Chapter 3, income returns are in general of a more stable nature than capital gains, due to the nature of subjacent lease contracts.

Table 4-5 - Significance of Iberian Market Segmentation Structures – Results of two-way ANOVA

This Table presents the results for the two-way ANOVA tests on the ITSL segmentation structure, for total return and its components. Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively .

Structure	Dimensions	Total Return		Capital Return		Income Return	
		F-stat	p-value	F-stat	p-value	F-stat	p-value
ITSL	Location	0,040	0,843	0,606	0,439	9,152	**0,004*** **
	Sector	17,322	**0,000*** **	7,591	**0,008*** **	34,167	**0,000*** **
	Interaction	0,007	0,932	0,062	0,805	0,791	0,377

The analysis of variance tests are very robust regarding the assumptions of normality of returns and of equal variance among groups, as long as the samples are not heavily unbalanced in size, which is the case in most of the tests in this study. It should be noticed, that the available data is scarce thus putting severe constraints on the sampling construction.

Regarding normality, the F test will not be seriously affected by positive or negative skewness, unless the sample sizes are small (less than 5), or the departure from normality is extreme (kurtosis less than -1 or greater than 2). In this case, although numerical tests tended to reject conformity with normality in most samples, departures are not significant, enabling the robustness of the test. In the end, the cases of POS and PRS with only 5 element samples per group are indeed the most questionable.

For the assumption of equal variance, when samples are unequal, which is the case of PTS,ITL and ITS, if the larger samples are associated with the populations with the larger variances (also valid in most cases in this study), then the F statistic will tend to be smaller than it should be, reducing the chance that the test will correctly identify a

significant difference between the means , thus making the test conservative (citation). Adding to this, in most situations variances do not exhibit substantial differences, again being the cases of POS and PRS with only 5 element samples per group the most questionable, despite the equal sample number.

Table 4-6 - Significance of Iberian Market Segmentation Structures – Results of one- way ANOVA on Location and Segmentation.

This Table presents the results for the one-way ANOVA tests on the ITL and ITS segmentation structures, for total return and its components. Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

Structure	Dimensions	Total Return		Capital Return		Income Return	
		F-stat	p-value	F-stat	p-value	F-stat	p-value
ITL	Location	0,222	0,639	1,950	0,166	25,641	**0,000*** **
ITS	Sector	15,871	**0,000 *** **	8,100	**0,006*** **	15,847	**0,000*** **

Besides the conformity with the basic assumptions for the ANOVA tests, a potential source of bias of these results is the use of samples with consolidated return points, instead of an analysis at the property level. The number of properties in each sub-segment used as data point is different and there is little perception to its representativeness, which can be large in some cases but very small in others. An analysis at the property level would certainly lead a much wider sample and be much more certain and conclusive in statistical terms, although in practice presenting difficulties in being obtained or being made available.

4.5 CONCLUSIONS

The aim of this study was to discover whether the IPD splits of the Portuguese real estate market explained a significant amount about property total returns and also of return components. This is as a relevant issue as they are used in portfolio construction and analysis. Also the consideration and differentiation of the analysis for return components is found to be rather important, despite being relatively disregarded in related literature.

Considering only the 00-04 five year sample period, the results show that the structures based on Sector differentiation are generally meaningful. Regional spread or location does not appear to be a significant factor to condition property returns. Only at the income component of return, is it concluded that most of the structures describe enough systematic pattern to be worth using.

Results are generally consistent, as the F-tests used are sufficiently robust to conform to situations of non-normality and unequal variances. However, the findings for subsector segmentations should only be considered tentative due to the very small sample size. Other data availability constraints such as the consolidated nature of the returns included may lead to significant bias, due to lack of control of the baseline sample characteristics. An analysis at the property level would certainly be preferable.

The findings may have natural implications for property portfolio managers acting in the Iberian market, and especially the Portuguese one. Firstly, they suggest that the influence of the Sector return drivers is larger than the Regional factors, thus justifying a diversification based on Sector, or a strategy based on sector specialization and diversification at the property level. Secondly they point to the conclusion that sub segment structures are only marginally important at the return level, maybe being more relevant as dimensions for investment product availability and more specific indicators.

Lastly, they seem to imply that that income returns are more sensitive to wider conditions than individual factors such as tenant and lease structure. Intuitively, this may well be a false conclusion due to the consolidated nature of sample points. Nonetheless, capital gains seem to be less sensitive to factors that rule common property structures, leading to the possibility of the existence of other groupings of properties yet to be found that will better reflect systematic drivers for capital growth. Due to the considerable limitations in available data, this study does not address the problem of time stability in the significance of the structures now tested.

As a whole, the results show that the choice of structure for the property portfolio is relevant and that different structures may be needed for different return components. In the Portuguese and Iberian property markets a diversification strategy based on pure regional split is unlikely to be as successful as one that uses property types, which is a similar conclusion as Devaney (2003) has drawn for the UK market. However, further research with a wider and more significant base sample is needed in order to confirm these findings and also to explore the time variable in the significance of the factors that are present in common property splits.

APPENDICES

Appendix 4-1 - PTS - Portugal Sector Total Return

This Table presents the detailed results for the one-way ANOVA tests on the PTS segmentation structures, for total return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	**Count**	**Sum**	**Average**	**Variance**
Retail	20	240,6168	12,0308	23,1434
Office	25	219,9343	8,7974	13,2350
Industrial	5	47,9169	9,5834	6,7184

ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between Groups	118,0780	2	59,0390	3,5383	**0,0370****	3,1951
Within Groups	784,2387	47	16,6859			
Total	902,3167	49				

Appendix 4-2 - PTS - Portugal Sector Income Return

This Table presents the detailed results for the one-way ANOVA tests on the PTS segmentation structures, for income return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	**Count**	**Sum**	**Average**	**Variance**
Retail	20	158,2749	7,9137	2,4799
Office	25	171,9773	6,879	1,8555
Industrial	5	35,28842	7,0577	0,5461

ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between Groups	12,2505	2	6,1253	3,0680	**0,0559***	3,1951
Within Groups	93,8347	47	1,9965			
Total	106,0852	49				

Appendix 4-3 - PTS - Portugal Sector Capital Growth

This Table presents the detailed results for the one-way ANOVA tests on the PTS segmentation structure, for capital growth (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Retail	20	76,5271	3,8264	14,4796
Office	25	44,1406	1,7656	8,3086
Industrial	5	11,8672	2,3734	5,5228

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	47,6115	2	23,8058	2,2530	0,1163	3,1951
Within Groups	496,6109	47	10,5662			
Total	544,2224	49				

Appendix 4-4 - POS - Portugal Office Sector Total Return

This Table presents the detailed results for the one-way ANOVA tests on the POS segmentation structure, for total return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Lisbon Offices: CBD	5	51,8170	10,3634	8,1636
Lisbon Offices: New office areas	5	34,5672	6,9134	17,7514
Lisbon Offices: Other areas	5	39,3465	7,8693	5,2075
Porto Offices	5	36,8312	7,3662	12,6892
Rest of Portugal	5	57,3724	11,4745	15,5010

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	80,3902	4	20,0976	1,6942	0,1908	2,8661
Within Groups	237,2505	20	11,8625			
Total	317,6407	24				

Appendix 4-5- POS - Portugal Office Sector Income Return

This Table presents the detailed results for the one-way ANOVA tests on the POS segmentation structures, for income return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Lisbon Offices: CBD	5	32,4791	6,4958	0,1860
Lisbon Offices: New office areas	5	32,2681	6,4536	2,8598
Lisbon Offices: Other areas	5	32,0571	6,4114	0,6453
Porto Offices	5	34,0472	6,8094	1,2052
Rest of Portugal	5	41,12575	8,2252	3,2826

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	11,8168	4	2,9542	1,8060	0,1673	2,8661
Within Groups	32,7157	20	1,6358			
Total	44,5325	24				

Appendix 4-6 - POS - Portugal Office Sector Capital Growth

This Table presents the detailed results for the one-way ANOVA tests on the POS segmentation structures, for capital growth (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Lisbon Offices: CBD	5	18,2344	3,6469	5,8381
Lisbon Offices: New office areas	5	1,31408	0,2628	9,6065
Lisbon Offices: Other areas	5	6,9044	1,3809	5,0652
Porto Offices	5	2,5856	0,5171	8,1749
Rest of Portugal	5	15,1021	3,0204	9,8185

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	45,3944	4	11,3486	1,4737	0,2475	2,8661
Within Groups	154,0127	20	7,7006			
Total	199,4071	24				

Appendix 4-7 - PRS - Portugal Retail Sector Total Return

This Table presents the detailed results for the one-way ANOVA tests on the POS segmentation structures, for total return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Regional shopping centres	5	67,2286	13,4457	5,6543
Sub-Regional shopping centres	5	78,5553	15,7111	21,6485
Other shopping centres	5	51,0236	10,2047	22,0680
Other retail	5	43,8094	8,7619	23,6021

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	147,8330	3	49,2777	2,7011	**0,0803***	3,2389
Within Groups	291,8915	16	18,2432			
Total	439,7245	19				

Appendix 4-8 - PRS - Portugal Retail Sector Income Return

This Table presents the detailed results for the one-way ANOVA tests on the PRS segmentation structures, for income return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Regional shopping centres	5	39,1518	7,8304	0,00854
Sub-Regional shopping centres	5	41,2757	8,2551	0,2788
Other shopping centres	5	40,2301	8,0460	2,7436
Other retail	5	37,6174	7,5235	8,3819

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	1,4665	3	0,4888	0,1713	0,9142	3,2389
Within Groups	45,6513	16	2,8532			
Total	47,1179	19				

Appendix 4-9 - PRS - Portugal Retail Sector Capital Growth

This Table presents the detailed results for the one-way ANOVA tests on the PRS segmentation structures, for capital growth (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Regional shopping centres	5	26,2014	5,2403	4,6231
Sub-Regional shopping centres	5	34,6454	6,9291	16,7678
Other shopping centres	5	9,99335	1,9987	12,9191
Other retail	5	5,68687	1,1374	6,7218

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	110,9858	3	36,9953	3,6065	**0,0366****	3,2389
Within Groups	164,1269	16	10,2579			
Total	275,1127	19				

Appendix 4-10 – ITSL –Iberian Total Return Two-Factor Anova – Sector and Location

This Table presents the detailed results for the two-way ANOVA tests on the ITSL segmentation structure, for total return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY			
	Retail	***Office***	***Total***
Portugal			
Count	16	16	32
Sum	184,5512	123,5047	308,0559
Average	11,5344	7,7190	9,6267
Variance	25,8511	10,1995	21,2006
Spain			
Count	16	16	32
Sum	182,8382	119,244	302,0822
Average	11,4274	7,452748	9,4401
Variance	5,2560	14,7453	13,7549
Total			
Count	32	32	
Sum	367,3894	242,7487	
Average	11,4809	7,5859	
Variance	15,0548	12,0884	

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Region	0,5576	1	0,5576	0,0398	0,8426	4,0012
Sector	242,7393	1	242,7393	17,3225	**0,0001*** **	4,0012
Interaction	0,1014	1	0,101428	0,0072	0,9325	4,0012
Within	840,7789	60	14,01298			
Total	1084,1772	63				

Appendix 4-11 - ITSL –Iberian Income Return Two-Factor Anova – Sector and Location

This Table presents the detailed results for the two-way ANOVA tests on the ITSL segmentation structure, for income return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY			
	Retail	***Office***	***Total***
Portugal			
Count	16	16	32
Sum	120,9532	101,2260	222,1793
Average	7,5595	6,3266	6,9431
Variance	1,9037	0,9351	1,7659
Spain			
Count	16	16	32
Sum	112,4515	85,6439	198,0954
Average	7,0282	5,3527	6,1905
Variance	0,8913	0,2312	1,2676
Total			
Count	32	32	
Sum	233,4048	186,8699	
Average	7,2939	5,8397	
Variance	1,4253	0,8091	

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Region	9,0630	1	9,0630	9,1517	0,0037	4,0012
Sector	33,8359	1	33,8358	34,1670	**0,0000*** **	4,0012
Interaction	0,7833	1	0,7833	0,7910	0,3774	4,0012
Within	59,4184	60	0,9903			
Total	103,1006	63				

Appendix 4-12 - ITSL –Iberian Capital Growth Return Two-Factor Anova – Sector and Location

This Table presents the detailed results for the two-way ANOVA tests on the ITSL segmentation structure, for total return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY			
	Retail	***Office***	***Total***
Portugal			
Count	16	16	32
Sum	59,3069	20,2019	79,5088
Average	3,7067	1,2626	2,4847
Variance	17,7990	7,3288	13,7001
Spain			
Count	16	16	32
Sum	66,2094	33,5661	99,7755
Average	4,1381	2,0979	3,1180
Variance	4,0699	13,1891	9,4256
Total			
Count	32	32	
Sum	125,5163	53,768	
Average	3,9224	1,6803	
Variance	10,6298	10,1081	

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Region	6,4178	1	6,4178	0,6056	0,4395	4,0012
Sector	80,4346	1	80,4346	7,5905	**0,0078*** **	4,0012
Interaction	0,6524	1	0,6524	0,0616	0,8049	4,0012
Within	635,8035	60	10,5967			
Total	723,3082	63				

Appendix 4-13 –ITL - Iberian Location Total Return

This Table presents the detailed results for the one-way ANOVA tests on the ITL segmentation structures, for total return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Portugal	55	573,5955	10,4290	18,8978
Spain	43	431,2895	10,0299	15,2591

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	3,8423	1	3,8423	0,2220	0,6386	3,9402
Within Groups	1661,3635	96	17,3059			
Total	1665,2059	97				

Appendix 4-14 - ITL - Iberian Location Income Return

This Table presents the detailed results for the one-way ANOVA tests on the ITL segmentation structure, for income return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Portugal	55	402,0099	7,3093	1,9768
Spain	43	252,9456	5,8825	1,8378

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	49,1293	1	49,1293	25,64132	**0,0000*** **	3,9402
Within Groups	183,9381	96	1,91602			
Total	233,0674	97				

Appendix 4-15 - ITL - Iberian Location Capital Growth

This Table presents the detailed results for the one-way ANOVA tests on the ITL segmentation structure, for capital growth (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Portugal	55	159,3699	2,8976	11,8422
Spain	43	169,0738	3,9320	15,0379

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	25,8173	1	25,8173	1,9500	0,1658	3,9402
Within Groups	1271,0680	96	13,2403			
Total	1296,8860	97				

Appendix 4-16 - ITS - Iberian Sector Total Return

This Table presents the detailed results for the one-way ANOVA tests on the ITS segmentation structure, for total return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Office	41	339,1783	8,2726	13,9115
Retail	35	412,0277	11,7722	15,3437

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	231,2437	1	231,2437	15,8717	**0,0002*** **	3,9702
Within Groups	1078,1455	74	14,5695			
Total	1309,3893	75				

Appendix 4-17 ITS - Iberian Sector Income Return

This Table presents the detailed results for the one-way ANOVA tests on the ITS segmentation structure, for income return (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Office	41	257,6212	6,283443	1,768254
Retail	35	263,6982	7,534235	1,976708

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	29,5399	1	29,5399	15,8473	**0,0002*** **	3,9702
Within Groups	137,9382	74	1,86403			
Total	167,4781	75				

Appendix 4-18 Iberian Sector Capital Growth

This Table presents the detailed results for the one-way ANOVA tests on the PRS segmentation structure, for capital growth (% p.a.). Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively **.**

SUMMARY				
Groups	***Count***	***Sum***	***Average***	***Variance***
Office	77,7067	1,895285	9,958025	77,7067
Retail	138,5984	3,959953	9,911628	138,5984

ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Between Groups	80,4894	1	80,4894	8,1003	**0,0057*** **	3,9702
Within Groups	735,3164	74	9,9367			
Total	815,8057	75				

CHAPTER 5 - THE INDIRECT MARKET – THE REAL ESTATE INVESTMENT FUND INDUSTRY

5.1 INTRODUCTION

To date, indirect market indices in Portugal are restricted to the universe of real estate investment funds, due to the practical inexistence of listed property companies.

REIFs in Portugal are now a major player in private land development projects and urban space renovation. A key issue for the upholding of this role is their ability to keep attracting private and institutional investment. This is ultimately dependent on their actual performance. In a global market, availability of indirect investment vehicles is growing exponentially and international players are today quite at ease in competing with national institutions in their territory. A deep knowledge and inside view of the REIF industry's behaviour and performance in the last 20 years can be a valuable contribution for the definition of a well sustained evolutionary strategy, both at the individual fund and industry levels.

In Portugal, relevant academic research addressing the REIF reality is scarce. Razina *et al.* (2005) present a study on the impact of tax exemption in REIF return, concluding that in 2004 more than 30% of industry's return was due to this fiscal exception framework. Silva (2005) used different autoregressive models on a sample of monthly return time series to evaluate structure changes due to the 2002 alteration on the legal framework of REIFs. According to the author, the different models circumstantially used provide good explanations of each fund's performance in most situations, but in the study little is developed or revealed neither around the founding justifications for the use of each specific model, nor on the real nature of return distributions or of the factors behind REIF return. In reality, there is not yet a consistent body of knowledge on such an important industry nor in depth analysis of return and performance of this prime indirect investment vehicle.

CHAPTER 5

This study aims at providing a contribution to the understanding of the nature of REIFs' return and performance. It starts with a basic characterization of REIF nature, covering issues like portfolio structure, valuation, management and regulations and then develops an analysis of REIF historical returns time series. The more specific purpose here is to found bases for future study of this asset class and for the creation of performance explanatory models.

As previously portrayed in Chapter 3, performance prediction and asset allocation models should de able to incorporate effects from current and future endogenous (e.g. traducing persistence, autocorrelations and other) and exogenous market factors and should consider the real nature of return distributions (Coleman *et al.*, 2005). Lizieri *et al.* (2001) recommend caution in using published property based performance indices and the previous examination of the structure of returns, especially in valuation based indices, which is the case with REIFs and other unitized investments. Departing from the factual scarcity of the scope of the available information on REIFs, very scarce research on it can be found, namely aiming to serve performance prediction and allocation models. The main objective of this chapter is the examination of the existing data regarding performance of the direct and indirect real estate investment market for prediction and allocation purposes. The main objectives established are:

1) To provide a detailed characterization of the most important data on the performance of indirect Portuguese real estate investment market that is available at this point covering sources, base sample and construction methods;

2) To provide a detailed analysis on the time series and cross-sectional data available as a basis for future research on performance prediction and attribution models; this will be done by time series trend analysis, return distribution analysis and discovery of endogenous and exogenous explanatory factors.

3) To assess fundamental performance models previously experienced on other realities and analyze short and long term performance persistence.

Real estate funds are regulated by the CMVM and have extensive duties of public information as described in Chapter 2. Total return of this investment vehicle depends on capital growth based on the movement of the unit price and distributions payable (gross of tax, net of expenses), if existent. Fund units value is calculated at least at the end of every month, or for open-ended funds every single day that unit subscription is available, taking into consideration the NAV, dividends paid and the total number of units, according to specific rules defined by CMVM[47].

Regulatory terms specify that at least 75% of the fund's NAV should correspond to direct or indirect real estate investment. Regarding the valuation of private commercial real estate, the regulatory framework imposed by the CMVM specifies rules for different asset types.

In general, the value of fully developed direct real estate assets should be established by the management in the interval between acquisition price and the arithmetic average of mandatory appraisals made by certified external experts. Therefore, real estate asset value is not necessarily at any given time the most probable "Open Market Value" as defined by RICS or TEGoVA. Intuitive implications of this fact are rather immediate – the objective existence of a significant level of management direct influence in the quantitative measures of fund value and fund performance induces strong potential bias factors and raises doubts about independence and transparency issues. Certainly set to minimize the latter, regulations also include the obligation of public disclosure of independent external appraisals for every property and the differences from the valuation

[47] See CMVM (2007)

set by the fund's management, which are named "potential asset value gains". Nevertheless, despite the quantification of this 'imposed' bias being a valuable indicator for the potential investor, in order to better assess the reality of the underlying assets and of management practices, it neither reveals nor justifies the reasons behind this fact nor even enables, in any form, the capitalization of those "potential asset value gains" by the investor.

Valuation of construction projects is done according to the methods defined in the fund's management regulation or whenever there is value incorporation in the construction above 10%, according to the quantity surveyor's situation report. This specification is vague and in practice just refers to definition of the moments of revaluation. It does not specify the methods to be used or entities ultimately responsible for setting the value, thus being even less objective than the one for developed property. Evidence of great flexibility in practices between funds can easily be found by a simple analysis of the public information on property portfolio structure.

Indirect real estate investment vehicles have recently been admitted as a possible part of REIFs' portfolios. This includes equity from property operating companies and also other property funds' units. They are obviously marked-to-market if quoted in a major regulated stock exchange, but otherwise their valuation is foremost made by accounting standards, with an undefined framework for this indirect condition, providing extra subjectivity. Nonetheless, this type of asset has, still today, absolutely no relevance in individual fund and global industry portfolios.

This framework for the calculation of the fund's NAV provides two main levels of subjectivity when addressing property assets: the appraiser's level and the manager's level, the second, apparently, being more important. An extensive analysis performed by IPD/Imométrica (2005) shows evidence of significant differences in valuation criteria

among the funds' property portfolio between external appraisers and the management, especially in some market segments. Hence, if appraiser's bias is mainly originated by difficulty in incorporating exogenous market factors (Baum *et al.*, 2002), manager's bias may also incorporate commercial motivations, in order to be able to "provide" the ideal (not necessarily the highest) return expected for this investment product, within the legal framework. This rule for the calculation of the NAV of the fund provides two levels of subjectivity when addressing property assets: the appraisers' level and the managers' level, apparently being the second more important. Results in IPD/Imométrica (2005), covering a small sample of transactions, show a considerable understatement of the value reported to the CMVM in comparison with the market property value (transaction price), which may rise to about 20%, depending on the property segment. The same relation occurs between reported and appraisal values, although with slightly less significance.

In order to perceive the real characteristics of REIF performance in the recent past and to assess which way they are related to structural and regulatory issues, a detailed time analysis was designed and developed. This analysis aims at serving as a founding basis for future research on performance prediction and attribution models by providing an insight into the characterization of the behaviour of REIF returns, their distributions, cross correlations, intra-industry segmentation, explanatory variables and potential model factors. Accordingly, the methodology for attaining these objectives has been established on the basis of previous research and includes trend and descriptive statistics analysis, return distribution analysis, variable interrelationship analysis at the class and fund levels and analysis of short and long term performance persistence.

5.1.1 Data Sample

For this work, a significant sample of data regarding the performance of 18 real estate funds was obtained from APFIPP, covering a period of eighteen years. This sample includes monthly total holding period returns (HPR) from May 1987 to May 2004 of a varying set of funds. This includes both open-ended and closed-ended funds, ranging from two at the beginning of the period to a total of eighteen at the end.

Tables 5-1 and 5-2 present a general structure and characteristics of the base data sample, which includes ten open-ended, and eight closed-ended funds. Overall the sample is quite significant regarding the universe of REIFs, as it represented around 70% of the global asset volume under management by the industry in December 2004. In sector terms, 10 of the 14 open-ended funds existent in December 2004 are included, representing more than 92% of the global assets under management. For closed-ended funds, the sample is naturally less representative in number (8 from a total of 51) but still rather significant in volume of assets under management, more than 41% of the total. From this base, different data samples were used according to the scope, nature and base hypothesis of the different analysis ahead developed. Both nominal and real returns were considered, the latter being obtained by deflating the first of the Consumer Price Index (CPI)[48],. In the tables, the column 'Relative property asset potential value gains' refers to the difference between the average of the two last appraisals and value reported to the CMVM (naturally lower). Evidence shows this to be rather significant in relative terms. Percentage of direct property asset on the NAV of open-ended funds is generally under 100%, because the financial leverage levels are very low, whether for closed-ended, the figures do raise above 100% in many cases, due to higher leverage.

[48] The series used was the long series with base in Jul 1997, obtained from Instituto Nacional de Estatítica (INE).

Figure 5-1- Open-ended Fund Sample Structure (in December 2004)

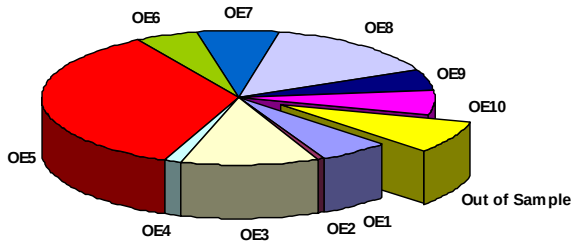


Table 5-1 – Open-ended Fund Sample Characteristics

This table contains the Characteristics of the funds included in the sample under study. Sources include CMVM and the annual fund reports of end 2004. Notes: * - Referred to June 30th, 2004 ; **- Referred to global direct real estate portfolio value in December, 31st, 2004.

Fund	Dividend Policy	Time Series of Total Returns available from	Relative Weight of NAV to REIF universe*	Relative property asset potential value gains **	Percentage of direct property assets on NAV **
OE1	Capitalization	Aug/2001	5,8%	2,3%	73,0%
OE2	Capitalization	Jun/1994	0,6%	10,8%	72,2%
OE3	Capitalization	Apr/2000	11,4%	6,1%	69,7%
OE4	Capitalization	Mai/1997	1,4%	3,8%	78,4%
OE5	Capitalization	Jul/1992	35,2%	27,4%	92,2%
OE6	Capitalization	Mar/2001	5,3%	2,6%	81,9%
OE7	Capitalization	Jan/2001	6,6%	12,3%	98,4%
OE8	Distribution	Jun/1987	14,8%	10,5%	98,2%
OE9	Distribution	Aug/1987	5,1%	5,1%	84,9%
OE10	Distribution	Dec/1987	5,9%	11,5%	88,3%
		Total Sample	**92,2%**	**17%**	**88,0%**

Figure 5-2- Closed Ended Fund Sample Structure

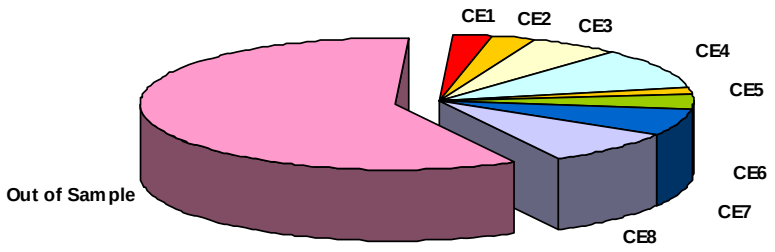


Table 5-2-Closed Ended Fund Sample Characteristics

This table contains the Characteristics of the funds included in the sample under study. Sources include CMVM and the annual fund reports of end 2004. Notes: * - Referred to June 30th, 2004 ; **- Referred to global direct real estate portfolio value in December, 31st, 2004.

Fund	Income Distribution	Time Series of Total Returns available from	Weight of assets under management relative to REIF universe	Relative property asset potential value gains **	Percentage of direct property assets on NAV **
CE1	No Distribution	Apr/2001	2,5%	4,8%	92,0%
CE2	No Distribution	Jun/1993	2,9%	19,9%	116,9%
CE3	No Distribution	Aug/2001	5,8%	3,2%	65,9%
CE4	No Distribution	Nov/1994	9,6%	4,6%	108,2%
CE5	Distribution	Apr/1993	2,0%	27,4%	103,4%
CE6	Distribution	Mar/2001	3,5%	3,3%	105,3%
CE7	Distribution	Jan/1996	6,5%	3,6%	86,3%
CE8	Distribution	Jan/1997	8,6%	4,0%	96,4%
		Total Sample	**41,4%**	**7,2%**	**95,5%**

5.1.2 Trend Analysis and Time Series Descriptive Statistics

For an analysis of the performance measures of the funds included in the general sample period, three different reference periods were considered: (1) the last three year period from June 2001 to May 2004 including nine open-ended funds and seven closed-ended; (2) a five year period from June 1999 to May 2004 including six open-ended funds and five closed end; (3) a ten year period from June 1994 to May 2004 including five open-ended funds and three closed-ended. The last reference period was further sub divided for stability analysis. Individual fund scatter plots over the reference periods are presented in annex.

Two types of analyses are relevant: the long term and short term behaviour of the series. Generally a long term downtrend in both nominal and real returns can be observed, which is confirmed by the trend of average monthly returns (Figures 5-3 and 5-5), the reference periods average returns (Figures 5-4 and 5-6) and the moving average plots presented in appendix. From the latter, slight differences in individual behaviour can be observed. These are probably linked to managing dependent factors like asset allocation, portfolio structure and tenant structure.

Noticeable differences can be perceived between open-ended and closed-ended average return plots. The first also exhibit a general downtrend, with a more regular evolution, despite some mild peaks or falls, probably corresponding to property revaluations or transactions with a sufficient impact on the consolidated results. The second exhibit a more unstable behaviour with many outliers and any evidence of a common trend can be hardly perceived. It is not likely in large property portfolios that sharp upward or downward corrections derive from changes the return income, due to its reasonably stable nature, but rather from the bunching and incorporation of valuations, from transactions or developing property.

Figure 5-3–Trends of OE Funds Nominal Monthly Returns (average by type)

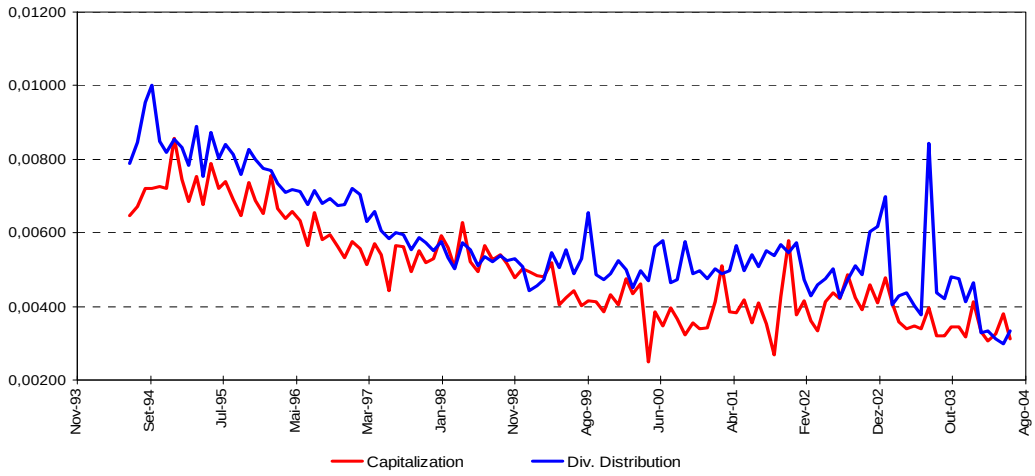


Figure 5-4- Average Total Monthly Returns for OE Fund Groups

(annualized and in percentage)

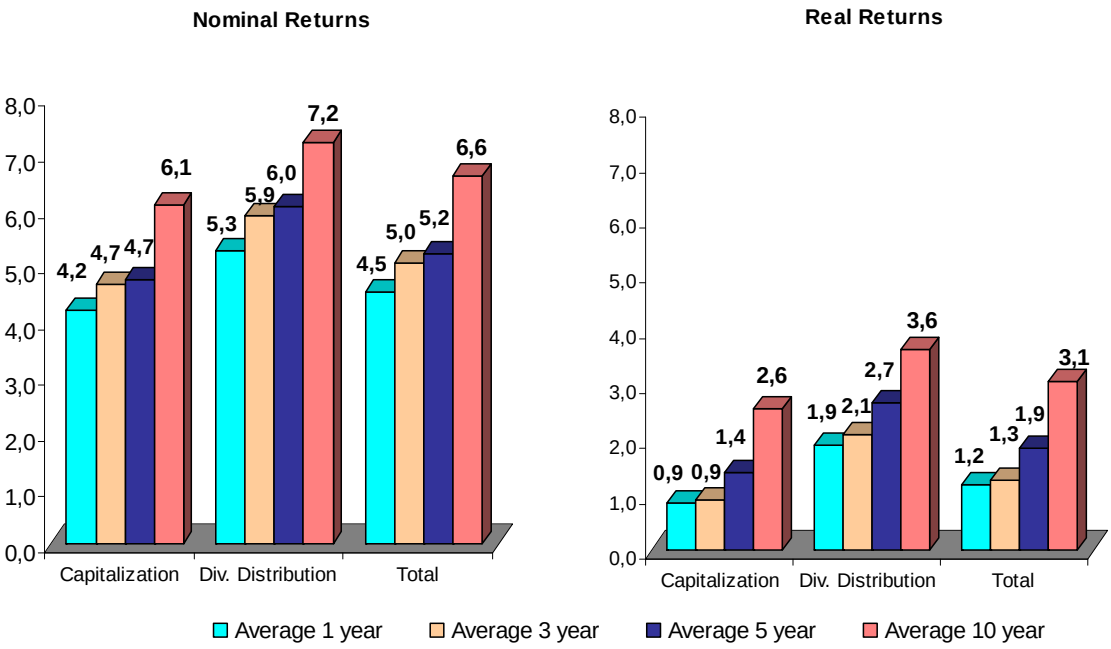


Figure 5-5– Trends of CE Funds' Nominal Monthly Returns (average by type)

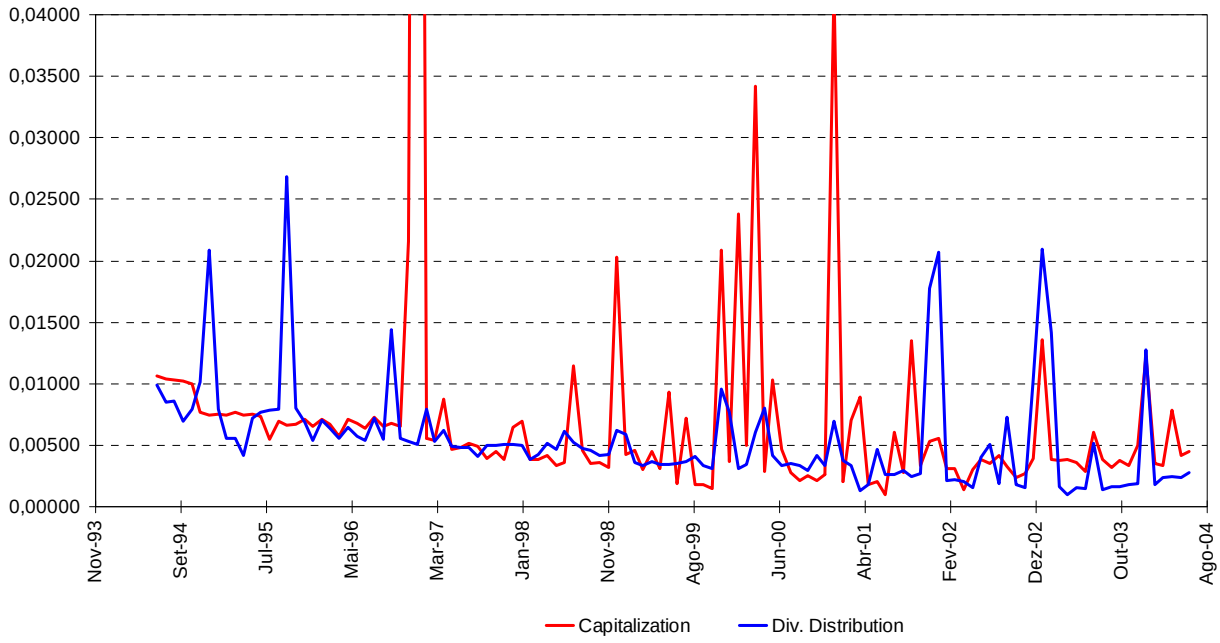
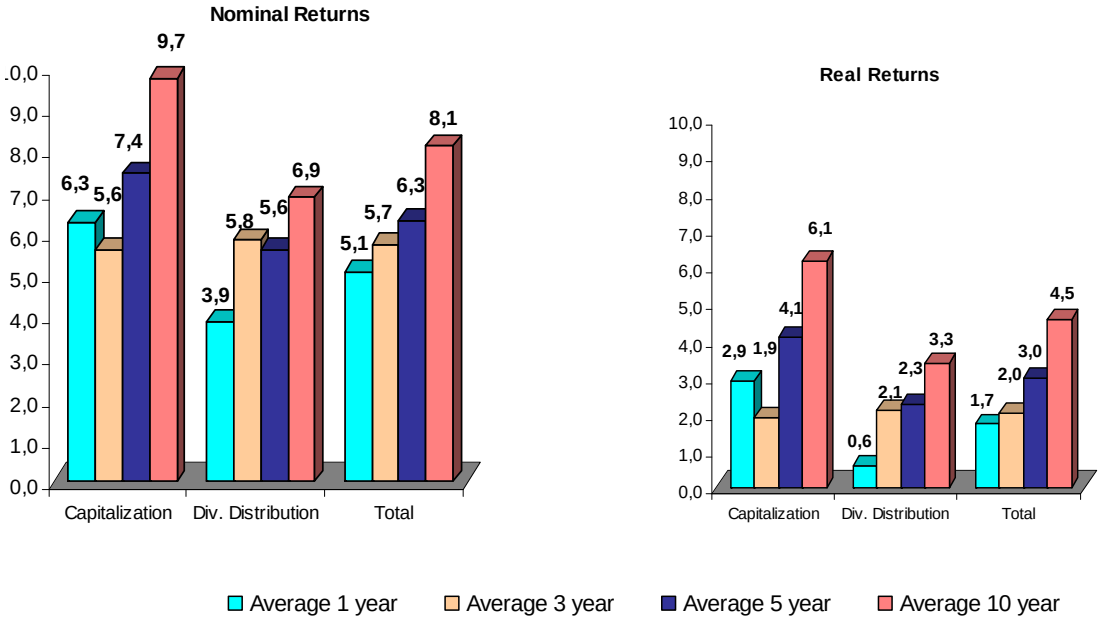


Figure 5-6 - Average Total Returns for Closed Ended Fund Groups

(Annualized and in percentage)



In reality, the differences in nature of open-ended and closed-ended funds imply that the first incorporate mostly core investment strategies. Core investments are investments that have rather low volatility, a strong and stable income component and small expected capital appreciations. These include mostly institutional grade fully-developed property with stable tenants and secure lease terms. On the other hand, the nature of closed-ended funds allows them to incorporate at a large percentage, or still to be solely focused on, value added and even opportunistic investments which include refurbishments, renovations, transformations and even land development projects. Here the return of investments is much more dependent on capital appreciation. Therefore, the first conclusion that can be drawn is that in the scope of closed-ended funds large differences at the fund level may be expected, as more considerable differences in strategic options of investment are admissible.

Also as a consequence of the latter, is that disparities in behaviour between open-ended and closed ended funds may be partially explained by the differences that exist in the incorporation of changes in capital value and the demand that their basic nature imposes on asset valuation updating – open-ended funds are valued every day and units can be subscribed or withdrawn at any time. As property asset update valuation is ultimately dependent on the fund's management team, different constraints produce different practices which ultimately result in different performance histories.

For a further insight on this subject there is a need to come down again to individual scatter plots identifying totally different behaviours from different funds, both within and between fund classes.

Regarding open-ended funds, there is no evidence of a direct implication of structural difference of behaviour between dividend distributing and capitalization funds. Despite this fact and also the previously referred common overall trend, there are significant

behavioural differences at the individual fund level regarding especially short term performance variations.

Some funds like OE3, OE6, OE7 and OE9 seem to display a larger tendency for discrete high positive peak values, thus to an asymmetrical behaviour. These funds have rather different sizes and existence periods, which seems to suggest that the bunching and incorporation of valuations at discrete time points may be the main factor for this common behaviour.

Other relevant observations include the intuitive appearance of the existence of persistent winners and persistent losers, even in long periods. Observation of 12 month moving average charts is highly suggestive in this sense, showing some funds to systematically outperform others during long periods of time or even throughout the whole time series period.

Also worthy of notice is that in shorter and more recent series there is further lack of stability. As shorter series correspond mostly to recently created funds this may be in most cases linked to recent and/or small fund structures to which may be added some potential impact of property acquisition and development operations. However, other explanations that may relate a rise in return volatility with market conditions or other industry conditioning variables should be examined in detail.

At the closed-ended fund set there is greater evidence of individuality and no apparent dividend policy class bunching. High volatility, high tendency for discrete high positive peak values and asymmetrical behaviour are here more the rule than the exception. This can be explained by valuation bunching or very sparse effective portfolio revaluations. As an actual exception, funds CE7 and CE8 show very low volatility and very stable and smooth parallel return trajectories. As they do not share any specific difference for the remaining group in terms of portfolio structure, this can be a further evidence of

significant managerial influence in terms of property asset valuation within the funds structure, which is closely related to the construction and reality of their performance measures, pointing to potential discrepancies and arbitrariness of criteria regarding quantification and timing for the incorporation of capital returns in the NAV and in the corresponding fund unit value.

Descriptive statistics for nominal and real returns are presented in Tables 5-3 to 5-6 for different reference periods and types of funds. Real estate indices are appraisal based, so they should suffer from appraisal smoothing effects, which would be expected to push them to exhibit lower volatility than any publicly traded stock indices. This is confirmed by the fact that the PSI20 stock index has a standard deviation (6,3% for monthly returns) much higher than that of the maximum standard deviation of any open-ended fund return (0,25%) . The comparison is also true for closed-ended funds, but some present a rather high volatility due to appraisal bunching or high periods without revaluation of property assets. Removing appraisal smoothing using standard methods would increase the volatility of real estate fund returns but not even close to stock levels. This result is in line with Lee *et al.* (2000) for the direct UK market.

Table 5-3 – Descriptive Statistics for Nominal Returns - Open-ended Funds

Open-ended Funds - Monthly Nominal Returns – Jun2001 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
OE2	36	0,0028	0,0020	0,0048	0,0036	0,0006	17,25%	-0,6399	0,3169
OE3	36	0,0054	0,0018	0,0072	0,0036	0,0013	36,17%	1,2567	1,4684
OE4	36	0,0014	0,0026	0,0039	0,0033	0,0004	11,75%	-0,2413	-1,0267
OE5	36	0,0018	0,0022	0,0040	0,0031	0,0005	15,53%	-0,2432	-0,9045
OE6	36	0,0110	0,0016	0,0126	0,0036	0,0019	53,98%	3,1009	12,6785
OE7	36	0,0050	0,0033	0,0083	0,0043	0,0008	17,99%	3,7557	19,2225
OE8	36	0,0014	0,0039	0,0053	0,0047	0,0004	7,63%	-0,4973	-0,8310
OE9	36	0,0150	0,0012	0,0162	0,0047	0,0029	61,26%	2,0051	5,9577
OE10	36	0,0035	0,0034	0,0069	0,0049	0,0008	17,00%	0,0406	-0,3860

Open-ended Funds - Monthly Nominal Returns – Jun1999 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
OE2	60	0,0028	0,0020	0,0048	0,0038	0,0005	14,60%	-0,8610	1,3507
OE4	60	0,0037	0,0026	0,0063	0,0039	0,0009	22,88%	0,7660	0,1231
OE5	60	0,0018	0,0022	0,0040	0,0033	0,0005	14,37%	-0,8337	-0,2607
OE8	60	0,0017	0,0039	0,0057	0,0048	0,0004	7,37%	-0,6101	0,2122
OE9	60	0,0150	0,0012	0,0162	0,0049	0,0024	49,47%	1,9946	7,1692
OE10	60	0,0035	0,0034	0,0069	0,0050	0,0007	14,89%	-0,0277	-0,0805

Open-ended Funds - Nominal Monthly Returns – Jun1994 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
OE2	120	0,0065	0,0020	0,0085	0,0052	0,0016	30,77%	0,1694	-1,2816
OE5	120	0,0076	0,0022	0,0098	0,0044	0,0014	32,16%	0,9601	0,7340
OE8	120	0,0056	0,0039	0,0096	0,0056	0,0011	19,60%	1,1929	1,0649
OE9	120	0,0150	0,0012	0,0162	0,0061	0,0025	40,46%	0,7113	1,5701
OE10	120	0,0054	0,0034	0,0088	0,0057	0,0014	24,11%	0,6126	-0,7034

Table 5-4 – Descriptive Statistics for Real Returns - Open-ended Funds

Open-ended Funds - Monthly Real Returns – Jun2001 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
OE2	36	0,0027	-0,0009	0,0018	0,0006	0,0006	104,79%	-0,4362	-0,4694
OE3	36	0,0060	-0,0017	0,0044	0,0005	0,0014	256,23%	0,9016	1,0385
OE4	36	0,0015	-0,0005	0,0010	0,0003	0,0004	132,63%	-0,2227	-0,7165
OE5	36	0,0010	-0,0003	0,0007	0,0001	0,0003	320,95%	0,2920	-1,0286
OE6	36	0,0105	-0,0015	0,0090	0,0006	0,0019	327,40%	2,9165	11,5147
OE7	36	0,0057	0,0004	0,0060	0,0013	0,0009	68,15%	4,6091	25,0815
OE8	36	0,0013	0,0010	0,0023	0,0017	0,0003	19,66%	-0,2207	-0,5722
OE9	36	0,0141	-0,0011	0,0130	0,0017	0,0028	164,92%	2,2696	6,9680
OE10	36	0,0032	0,0006	0,0038	0,0018	0,0007	35,50%	0,7769	0,8168

Open-ended Funds -Monthly Real Returns – Jun1999 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
OE2	60	0,0038	-0,0009	0,0029	0,0011	0,0008	78,38%	-0,1081	-0,3067
OE4	60	0,0048	-0,0005	0,0044	0,0012	0,0013	107,29%	0,7891	-0,4577
OE5	60	0,0026	-0,0003	0,0023	0,0007	0,0008	121,83%	0,5839	-1,1219
OE8	60	0,0027	0,0010	0,0037	0,0021	0,0007	33,21%	0,4969	-0,7653
OE9	60	0,0141	-0,0011	0,0130	0,0022	0,0025	112,34%	1,7367	5,4101
OE10	60	0,0032	0,0006	0,0038	0,0023	0,0008	33,96%	-0,0830	-0,9611

Open-ended Funds - Monthly Real Returns – Jun1994 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
OE2	120	0,0058	-0,0009	0,0049	0,0024	0,0015	63,82%	-0,1892	-1,2201
OE5	120	0,0057	-0,0003	0,0054	0,0016	0,0013	77,50%	0,1404	-0,6887
OE8	120	0,0040	0,0006	0,0046	0,0028	0,0009	32,64%	-0,3589	-0,9979
OE9	120	0,0141	-0,0011	0,0130	0,0033	0,0022	67,23%	0,4245	2,0335
OE10	120	0,0045	0,0006	0,0051	0,0029	0,0010	35,37%	0,1330	-0,5538

Table 5-5 – Descriptive Statistics for Nominal Returns - Closed Ended Funds

Closed Ended Funds - Nominal Monthly Returns – Jun2001 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
CE1	36	0,0122	0,0000	0,0122	0,0048	0,0024	50,68%	0,3722	1,6164
CE2	36	0,0245	-0,0062	0,0183	0,0032	0,0050	156,69%	2,0395	4,6186
CE3	34	0,0124	0,0011	0,0135	0,0042	0,0028	66,74%	1,5382	2,3981
CE4	36	0,0323	0,0009	0,0332	0,0061	0,0078	128,56%	2,8059	7,2014
CE5	36	0,0513	-0,0006	0,0507	0,0063	0,0137	217,26%	2,7220	6,3277
CE6	36	0,0623	-0,0021	0,0602	0,0065	0,0147	227,48%	2,5806	6,1392
CE7	36	0,0018	0,0025	0,0043	0,0031	0,0005	15,76%	1,2762	0,4452
CE8	36	0,0016	0,0024	0,0040	0,0030	0,0004	13,55%	1,0410	0,2649

Closed Ended Funds - Nominal Monthly Returns – Jun1999 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
CE2	60	0,0712	-0,0062	0,0650	0,0056	0,0113	201,56%	3,5997	14,6251
CE4	60	0,0456	0,0009	0,0465	0,0065	0,0094	145,83%	3,1049	9,1340
CE5	60	0,0534	-0,0026	0,0507	0,0062	0,0112	180,07%	2,9711	8,9215
CE7	60	0,0018	0,0025	0,0043	0,0033	0,0005	14,57%	0,4481	-0,8151
CE8	60	0,0016	0,0024	0,0040	0,0032	0,0004	12,60%	0,4621	-0,5033

Closed Ended Funds - Nominal Monthly Returns – Jun1994 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
CE2	120	0,3448	-0,0062	0,3386	0,0086	0,0316	365,86%	9,7545	101,5252
CE4	115	0,0456	0,0009	0,0465	0,0068	0,0073	108,29%	3,8065	15,1625
CE5	120	0,0534	-0,0026	0,0507	0,0065	0,0085	131,28%	3,4841	14,4081

Table 5-6 – Descriptive Statistics for Real Returns – Closed Ended Funds

Closed Ended Funds - Monthly Real Returns – Jun2001 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
CE1	36	0,0122	-0,0030	0,0092	0,0020	0,0023	117,38%	0,6419	1,8304
CE2	36	0,0245	-0,0095	0,0150	0,0001	0,0050	3868,24%	1,9758	4,3986
CE3	34	0,0126	-0,0018	0,0108	0,0012	0,0028	240,44%	1,5075	2,4268
CE4	36	0,0321	-0,0025	0,0296	0,0030	0,0078	255,49%	2,7993	7,1520
CE5	36	0,0509	-0,0038	0,0471	0,0033	0,0136	407,43%	2,7088	6,2623
CE6	36	0,0616	-0,0051	0,0564	0,0035	0,0146	414,26%	2,5751	6,0960
CE7	36	0,0013	-0,0006	0,0008	0,0001	0,0003	325,73%	0,1629	-0,4803
CE8	36	0,0018	-0,0009	0,0009	0,0000	0,0004	-	0,3027	-0,3021

Closed Ended Funds - Monthly Real Returns – Jun1999 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
CE2	60	0,0726	-0,0095	0,0632	0,0029	0,0115	393,54%	3,6002	14,6706
CE4	60	0,0466	-0,0025	0,0440	0,0037	0,0094	251,23%	3,1240	9,3551
CE5	60	0,0527	-0,0056	0,0471	0,0036	0,0112	313,61%	2,8685	8,3756
CE7	60	0,0025	-0,0006	0,0020	0,0006	0,0007	115,05%	0,2338	-1,3267
CE8	60	0,0026	-0,0009	0,0017	0,0005	0,0007	152,65%	0,0317	-1,2289

Closed Ended Funds - Monthly Real Returns – Jun1994 to May 2004

	Count	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Dev.*	*CV*	*Skewness*	*Kurtosis*
CE2	120	0,3447	-0,0095	0,3353	0,0058	0,0316	542,88%	9,7548	101,4678
CE4	115	0,0466	-0,0025	0,0440	0,0040	0,0074	182,47%	3,7926	15,2111
CE5	120	0,0527	-0,0056	0,0471	0,0037	0,0084	229,41%	3,4750	14,3567

Although there is some tendency for positive skewness in open-ended fund returns, especially for longer reference periods, there is no strong evidence pointing to a systematic incidence. Out of 20 samples of nominal return time series, 12 were positively skewed and 8 negatively skewed. Real return samples presented similar results. Results for the same fund differ between reference time periods.

Lee *et al.* (2000) indicate that tendency for weak positive skewness in returns would be expectable for real estate indices because falls in returns are damped by the contractual nature of leases (limiting falls in income) and also due to potential reluctance from appraisers for lowering on previous valuations. Nevertheless, in the Portuguese market, the legal framework on property leases is not so preventative of income drops, as it empowers the tenant to leave at any time with only 3 months prior notice, thus forcing to some extent bargaining positions from the owners for keeping tenants. This may explain some of the differences. Moreover, Young *et al.* (2006), refer to the fact that both positive and or negative skewed distributions were found for property based return indices, mainly varying in a country basis.

Kurtosis values present the same general indefinite nature: from the 20 samples of nominal return time series, 12 showed positive kurtosis, but only 3 had significant leptokurtic characteristics, thus meaning less peakedness than normally distributed data or in other words the indication of a "short tailed" distribution. Nonetheless, the results are again non-uniform, suggesting that real factors behind the nature of the return series are endogenous to each fund.

In closed-ended funds the evidence of positive skewness and kurtosis is more generalized. Again here, the results are not consistent throughout the sample, again supporting the suggestion that real factors behind the nature of each fund's return series

are endogenous and related to managerial and accounting degrees of freedom. No significant differences between real and nominal returns were found.

The previous results are inconclusive as to ascertaining defined characteristics to return distributions at the industry level. They point to the supremacy of specific endogenous fund factors behind return distributions. The large behavioural differences in short term variation of returns for this type of investment point to substantial weight of the subject of property asset valuation within each fund's structure, which is closely related to the construction and reality of their performance measures. This appears to recommend the use of performance models based (at least partially) in lagged performance factors, in the line of Silva (2005). If so, ultimately the question is: for each fund, what are the underlying criteria for quantification and incorporation timing of capital returns in the NAV and in the corresponding fund unit value?

5.1.3 Normality of Return Distributions

Normality of distributions is a major issue in performance explanation as it is a base hypothesis of many allocation and prediction models. A relevant body of literature, previously referred in to Chapter 3, provides strong evidence that returns for property based asset classes are not normally distributed. Studies on distributional properties of direct real estate market data at the individual, sub-market, or index level in a number of countries, have reached largely analogous results (see Young *et al.,* 2006, for a thorough review). Evidence of non-normality in market and segment return data samples is largely due to excess kurtosis and significant skewness, positive or negative depending on the country. This evidence is strongest with monthly data. For quarterly and annual data, tendency for excess of kurtosis remains but not for considerable skewness, so rejection of Normality is found to be generally less consistent. These conclusions are valid for both

raw and unsmoothed returns, which substantiates the fact the non Normality of real estate is mainly founded on the illiquidity of the market and cannot be corrected by un-smoothing processes.

In the present study, for testing the normality of Portuguese REIF return distributions, three statistical tests were used: the Shapiro-Wilk test, the Anderson Darling test and the Jarque-Bera test, following a similar procedure used by Maurer et al (2004) for comparing the distributional properties of US, UK, and German direct real estate returns. The adoption of multiple tests is justified with the actual diversity of choices in the specific literature for this kind of procedure, which are in turn based in different perceptions of the power of each test and of its applicability scope. The Shapiro-Wilk and the Anderson Darling tests are generally considered to be the most powerful statistics for detecting most departures from normality (Stephens,1974). The Jarque-Bera test is widely used in econometric analysis as it is based on the distribution's characteristic parameters of skewness and kurtosis, rather than pure distance considerations.

The Shapiro-Wilk test tests the null hypothesis that the sample of ***n*** elements came from a normally distributed population. The test statistic is provided by ***W*** as defined in equation (5-1) :

$$W = \left(\sum_{i=1}^{n} a_i x_{(i)} \right)^2 \Bigg/ \left(\sum_{i=1}^{n} (x_i - \bar{x})^2 \right) \qquad \textbf{(5-1)}$$

where ***i*** is the ***i***$^{\text{th}}$-smallest number in the sample, $\bar{x}$ is the sample mean and the constants a_i are given by equation (5-2):

$$(a_1, \ldots, a_n) = \frac{m^T V^{-1}}{(m^T V^{-1} V^{-1} m)^{1/2}} \qquad \textbf{(5-2)}$$

where ***m*** holds the expected values of the order statistics of an identically independent distributed sample from the standard normal distribution, and **V** is the covariance matrix of those order statistics. The test rejects the null hypothesis if ***W*** is too small.

The Anderson-Darling test is a powerful statistics for detecting departures from normality and may be used with small samples. The test statistic ***A*** assesses if data comes from a distribution with cumulative distribution function ***F*** and is given by equation (5-3):

$$A^2 = -N - S \tag{5-3}$$

where

$$S = \sum_{i=1}^{n} \frac{2i-1}{n} \left[\ln F(x_i) + \ln\left(1 - F(x_{n+1-i})\right) \right] \tag{5-4}$$

The test statistic can then be compared against the critical values of the theoretical distribution to determine the p-value.

The Jarque-Bera test is a goodness-of-fit measure of departure from normality, based on the sample's kurtosis and skewness. The test statistic ***JB*** is defined in equation (5-5):

$$JB = \frac{n}{6}\left(S^2 + \frac{(K-3)^2}{4} \right) \tag{5-5}$$

where ***n*** is the number of observations (or degrees of freedom in general), ***S*** is the sample skewness and ***K*** is the sample kurtosis. The ***JB*** statistic has an asymptotic chi-square distribution with two degrees of freedom and can be used to test the null hypothesis that the data is derived from a normal distribution. The null hypothesis imposes that both the skewness and excess kurtosis are zero, as expected from samples retrieved out of a normal distribution.

Only funds with a number of sample returns over 60 were considered, for statistical robustness of the tests. Results from normality tests are presented in Table 5-7 for nominal returns and in Table 5-8 for real returns. In both cases they are rather conclusive. The null hypothesis of the samples belonging to a normal distribution were rejected simultaneously by the 3 tests, at least at the 5% significance level, in more than 95% on the cases both in open-ended and closed ended funds, for real and nominal returns. For all samples the rejection of the null hypothesis at the 1% a significance level occurred at least in 2 out of the 3 tests. These results are in line with most of the literature regarding the non-normal nature of property based index returns (Maurer *et al.,* 2004, Young *et al.,* 2006), but are rather more significant than in the other cases and markets where studies are available.

Table 5-7 – Normality Tests for Nominal Returns

This table contains the results of normality tests performed for nominal returns of all funds with over 60 data points. Only shaded values indicate conformity with the null hypothesis, or in other words a sample drawn from a normal distribution. All other cases show rejection of normality, with a probability of the null hypothesis having been rejected in error generally under 1%.

		OE2	OE5	OE8	OE9	OE10	CE2	CE4	CE5
Shapiro-Wilk	**W**	0,928	0,925	0,883	0,966	0,919	0,200	0,495	0,618
	p-value	0,000	0,000	0,000	0,004	0,000	0,000	0,000	0,000
Anderson-Darling	**A^2**	3,968	3,141	5,453	0,575	3,928	$+\infty$	19,028	12,849
	p-value	0,000	0,000	0,000	**0,133**	0,000	0,000	0,000	0,000
Jarque-Bera	**JB**	9,086	19,292	31,162	19,169	10,038	47535,860	1224,260	1140,296
	p-value	0,011	0,000	0,000	0,000	0,007	0,000	0,000	0,000

This was highly predictable following the results obtained for descriptive statistics. An important direct implication of this fact is the non-compliance with basic hypothesis of

classical performance explanation and asset allocation models, such as the CAPM or MPT. Naturally, further development would come from the testing of other distributional hypothesis, following Coleman *et al.* (2005).

Table 5-8 – Normality Tests for Real Returns

This table contains the results of normality tests performed for real returns of all funds with over 60 data points. Only shaded values indicate conformity with the null hypothesis, or in other words a sample drawn from a normal distribution. All other cases show rejection of normality, with a probability of the null hypothesis having been rejected in error mostly under 1%.

		OE2	OE5	OE8	OE9	OE10	CE2	CE4	CE5
Shapiro-Wilk	**W**	0,943	0,952	0,946	0,953	0,977	0,195	0,513	0,616
	p-value	0,000	0,000	0,000	0,000	0,035	0,000	0,000	0,000
Anderson-Darling	**A^2**	2,571	1,851	2,593	1,034	0,822	$+\infty$	17,883	13,245
	p-value	0,000	0,000	0,000	0,010	0,033	0,000	0,000	0,000
Jarque-Bera	**JB**	8,478	3,182	7,848	19,854	2,273	47483,839	1228,124	1132,913
	p-value	0,014	**0,204**	0,020	0,000	**0,321**	0,000	0,000	0,000

5.1.4 Predictability Factors

The evidence of ability to predict direct or indirect property market returns has been previously presented in Chapter 3. If in fact there are variables or factors that show power to condition or explain the variation of returns, they should be used in performance explanatory models. For the property market, the evidence of predictability includes phenomena of serial dependence of consecutive period returns, especially in a short period (1 to 6 months) basis, which is proven by high autocorrelations in return series (Lee *et al.*, 2000) and persistence of performance (see e.g. Lee, 2003, Lin *et al.*, 2004, among others). Another important finding is the existence in many markets of industry driving or leading indexes, especially for indirect indices based on property companies or

REITs stock to lead direct ones (Booth *et al.,* 2003) . Other external variables such as securities indexes, have been tested for correlation with property returns (see e.g. Brown, *et al.,* 1996, Liang *et al.,* 1996, Lee *et al.,* 2000, among others).

In this study, and both at the individual fund level and at the industry level, two types of potential explanatory factors were investigated: endogenous factors and exogenous factors. Regarding the first, the topics covered were autocorrelation and serial persistence. This study aims at providing more evidence and data to address the question of whether Portuguese REIF returns are totally random and serially independent or else, like previous research on similar realities suggests, that real estate returns in general, and real estate funds specifically, are serially dependent and predictable on endogenous factors. Some light on this subject for the Portuguese REIF industry has been provided by Silva (2005), however with a different specific purpose, so it remains largely unaddressed. As for the exogenous factors, the present work focused on the analysis of correlation with real estate market related variables, and also some other indexes external to the property universe like macroeconomic variables and construction market indices, in a similar way as previously investigated for other markets but with local and circumstantial adaptation.

The autocorrelation (AC) of lag ***n*** is defined as the serial correlation between the current time series and the same time series lagged of ***n*** time periods. If a time series exhibits significant autocorrelation of lag n, it mean that the events and movements of that time series are strongly explained and related to the events and movements that have occurred n time periods before. This goes against the hypothesis of any serial independence or of independent identically distribution of returns. Partial auto correlations (PAC) are an extract of the single contribution of each lag interval for the autocorrelation effect.

Statistical evidence for appraisal (and managerial bias) smoothing effects like serial dependence may be found by examining the serial correlation in returns. *A priori*, Lee *et al.* (2000) find that considerable autocorrelation in the valuation-based private real estate indices should be expected as opposed to small autocorrelation values in the publicly traded stock market series.

In this work, autocorrelations and partial autocorrelations between individual REIFs were determined for both nominal and real return time series, in all open-ended and closed-ended funds with over 60 data points, and for lags up to 13 months. Results are presented graphically in Tables 5-9 to 5-11 and in tabular form in appendix. Comparable evidence from the PSI20 stock index for the same period is also presented.

Evidence generally confirms some expectations but not all. Observation of the table in the appendix reveals that the national stock index series contains very little autocorrelation (potentially conforming to weak form market efficiency) .Open-ended funds exhibit in general very high, and continuous levels of autocorrelation at any lag and no major specific peaks of autocorrelations are noticeable, even for funds distributing periodic dividends. These values are statistically significant at least at the 1% level.

It is noticeable that there is no major drop in values from the 1 month lag to the 13 month lag indicating that AC could be significant even for larger lags, which is not consistent with the results presented by Lee *et al.* (2000), were autocorrelations dropped for non significant values at the one year lag. This suggests that Portuguese open-ended funds seem to present a greater and longer serial dependence of returns than general valuation based indices, which may be due to a very long period between consecutive appraisals but also to excessive managerial smoothing influence on the final property valuations reported to the CMVM. PAC values indicate that there is no special contribution from

any lag to the high level of serial correlation, thus supporting the existence of a structural and constant factor behind the facts evidenced.

The only eventual exception seems to be fund OE9 that has much smaller values of autocorrelations. Seemingly worthy of notice is the rise of autocorrelation at the 6 and 12 months lag, certainly related to the periodical distribution of dividends every half year. This is followed also by a more significant partial autocorrelation. Many possibilities arise for an explanation of this fact against the general reality: a specific accounting or managerial option that inputs valuation updates in a more randomly or discrete fashion, inexistence of managerial drive for valuation smoothing, less evidence of managerial influence on appraisal values, among other. Evidence from the fund's related information is rather inconclusive.

Closed ended funds however present very low levels of autocorrelation, not significant in a statistical sense. This evidence is related to the more pronounced random nature of their monthly returns, presented before, and to the fat tailed nature of their distributions.

However, in some very specific situations there are slightly more significant AC and PAC values around the 12 months lag. This could be related either to annual accounting input of capital returns, to periodic dividend distribution (as is the case of CE5 where this effect is more evident) or other events that may influence total returns. Again, this reality would conform to evidence found on other appraisal based indexes, but rather pointing in the opposite direction. However, seasonality tests based on moving averages were applied to nominal returns, but in general have failed to find substantial evidence of seasonality in the data. This finding goes against any intuition of valuation grouping at the end of the year, associated with financial reporting. The results suggest that each fund leads a specific procedure regarding valuation update, which in most cases is neither transparent nor constant. Lastly, the large number of funds in the sample and the large sample period

precludes the hypothesis of valuations being gathered in particular months with positive and negative changes cancelling each other, and seasonality being missed Lee *et al.* (2000).

Table 5-9 - Autocorrelations Open-ended

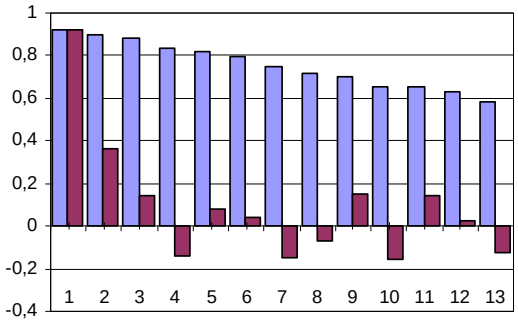
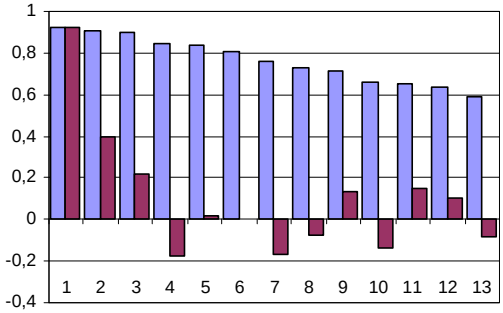
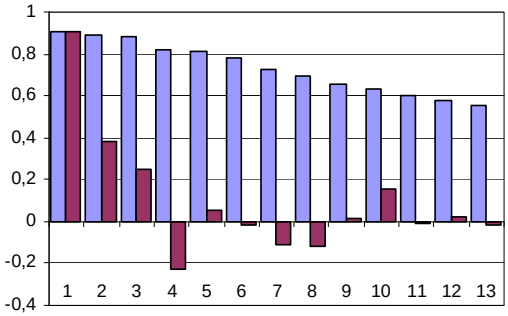
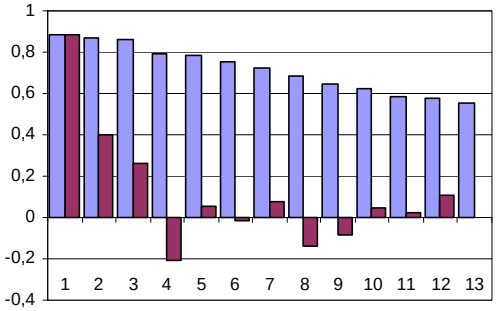
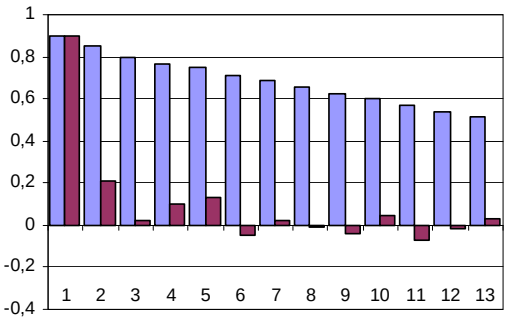
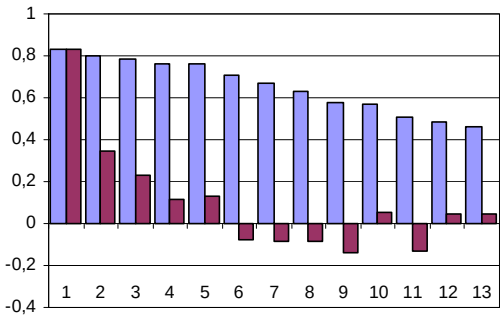
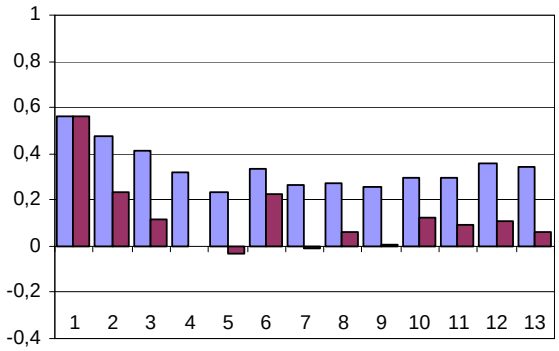
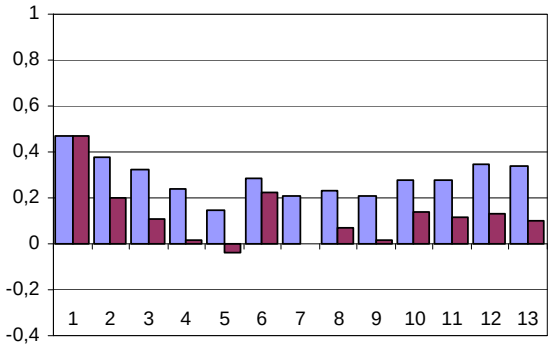
OE2- Nominal	OE2 - Real
	
OE5 - Nominal	**OE5 - Real**
	
OE8 - Nominal	**OE8 - Real**
	

Table 5-10 - Autocorrelations Open-ended

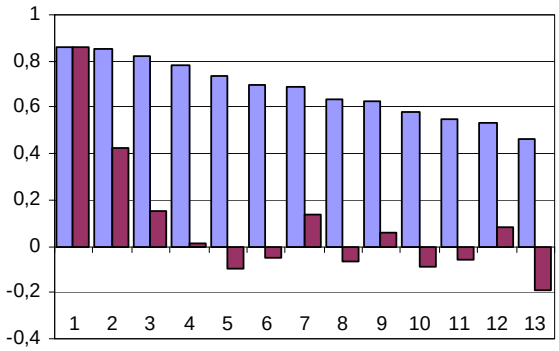
OE9 - Nominal



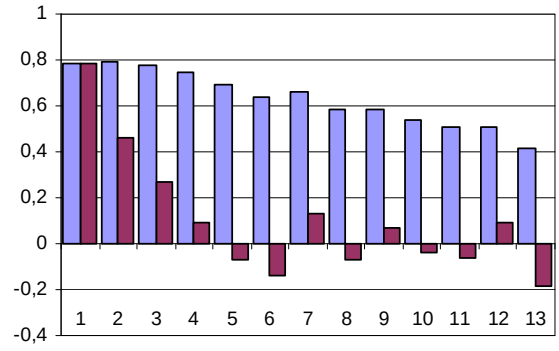
OE9 - Real



OE10 - Nominal



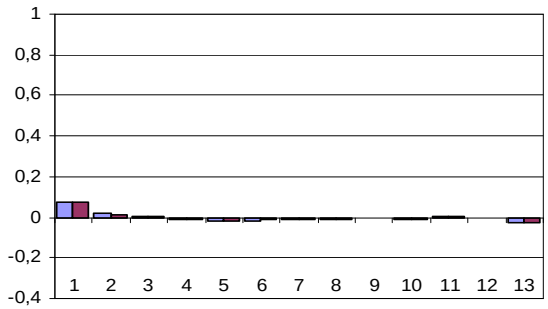
OE10 - Real



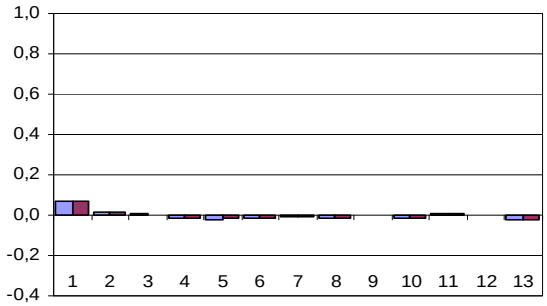
AC PAC

Table 5-11 – Autocorrelations Closed Ended

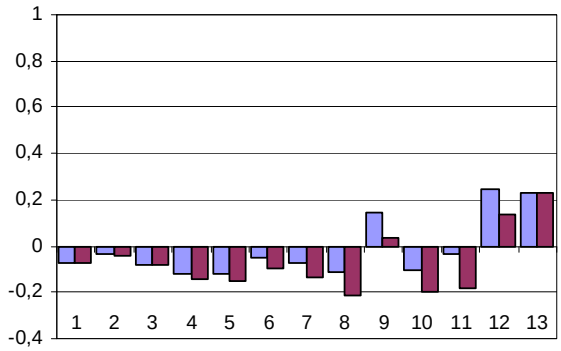
CE2 - Nominal



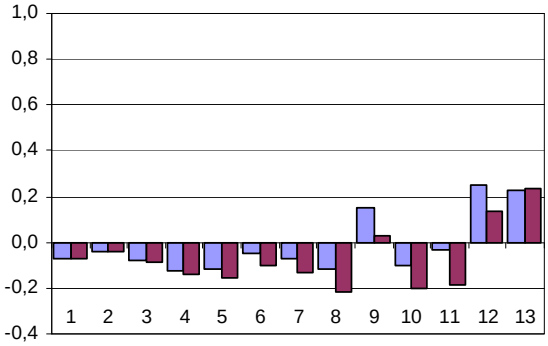
CE2 - Real



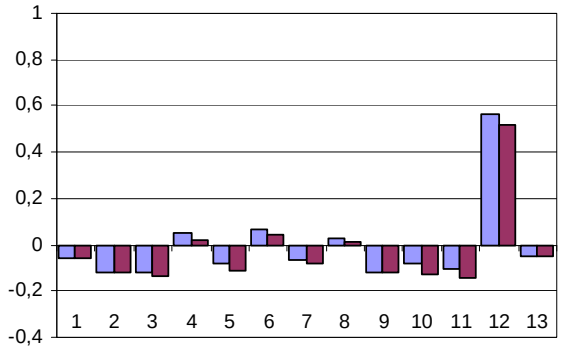
CE4 - Nominal



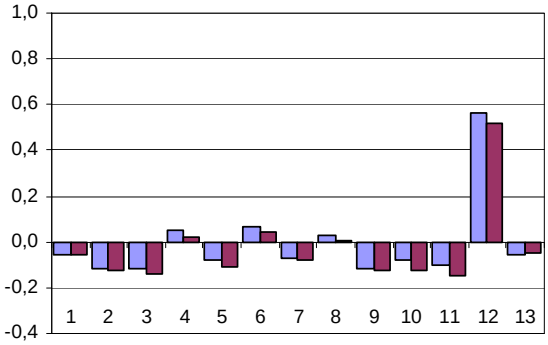
CE4 - Real



CE5 - Nominal



CE5 - Real



AC PAC

Contemporaneous correlations between total returns of individual funds were computed for the three reference periods: (1) the last three year period from June 2001 to May2004 including nine open-ended funds and seven closed-ended; (2) a five year period from June 1999 to May 2004 including six open-ended funds and five closed-ended; (3) a ten year period June 1994 to May 2004 including five open-ended funds and three closed-ended. The last reference period was further sub divided for stability analysis. Results are presented in a consolidated form in Table 5-12 and Table 5-13 and in further detail in appendix.

Again, as expected, open-ended funds exhibit very high levels of cross-correlation, which reveals a very strong intra resemblance between investment strategies and return evolution. In fact, as hitherto referred, the portfolio of open-ended funds includes mainly core investments, which implies a great importance of stable lease income returns and a minor relevance of capital appreciation. On the other hand, as some previous evidence suggests, the liquid nature of units and a large investor base may imply a common smoothing tendency in management valuation, which may not be universal though.

Table 5-12 – Correlations for Nominal Returns

This table contains the contemporaneous correlation for nominal returns of all funds n the sample with data between Jun1994 and May2004. (**) Indicates a correlation coefficient significantly different from 0, at the 5% level.

Nominal Return Correlations – Jun1994 to May 2004

	OE2	OE5	OE8	OE9	OE10	CE2	CE4	CE5
OE2	1	0,888(**)	0,844(**)	0,616(**)	0,715(**)	-0,074	-0,058	-0,045
OE5	0,888(**)	1	0,884(**)	0,667(**)	0,836(**)	-0,106	-0,079	-0,077
OE8	0,844(**)	0,884(**)	1	0,661(**)	0,850(**)	-0,131	-0,062	-0,040
OE9	0,616(**)	0,667(**)	0,661(**)	1	0,604(**)	0,000	-0,071	-0,047
OE10	0,715(**)	0,836(**)	0,850(**)	0,604(**)	1	-0,102	-0,077	-0,087
CE2	-0,074	-0,106	-0,131	0,000	-0,102	1	0,052	0,053
CE4	-0,058	-0,079	-0,062	-0,071	-0,077	0,052	1	0,436(**)
CE5	-0,045	-0,077	-0,040	-0,047	-0,087	0,053	0,436(**)	1

In fact, some of the funds like OE3, OE6, OE7 and OE9 do not seem to follow this common trend. These funds, as previously evidenced, are the exact ones that show high positive skewness and kurtosis, which indicate the existence of a non symmetrical distribution, with a great tendency for peak values. These may be correspondent to the existence of discrete revaluations of significant parts of the portfolio, rather than a smoothing of capital appreciation. These differences naturally fade out in the long run, as evidenced by fund OE9. A common long-term trend, but different short-term behaviour, seems to suggest that valuation criteria, mainly regarding the setting and discrete timing of property asset values is largely arbitrary and that capital appreciation has been historically a rather relevant part of total return.

As it would be suggested by previous findings, there is almost no observable correlation between the returns of different closed-ended funds. This reveals behavioural individuality, which can be based on structural reasons, mainly related to the fact of these funds including value added and opportunistic investments in their portfolios. This may be especially important in recent funds. Only a detailed analysis at individual level covering portfolio structure could be able to confirm this early assessment. Moreover, adding to this there may be a valuation bias specific to each fund that individualizes short term behaviour, but is less perceptive in the long term. This can be verified by analyzing the moving average plots of longer series in appendix, which show milder differences.

As for extra fund industry explanatory variables, the first logic relation is with the direct market indices as used by Lee (1997) and Lee (1999). As REIFs hold diversified portfolios, with a majority of direct property, it would be highly expected that their return would be highly correlated with the direct market indices. The major difficulty for testing this hypothesis lies in the annual nature of the IPD indexes (the only ones existing for this market) and on the short extent of the series (only covering five years on the reference

period). As a surrogate for monthly direct property indexes, a monthly series based on a linear interpolation of the monthly equivalent return of the annual IPD indexes was calculated, in a similar procedure as Lee *et al*. (2000). Also, due to the high exposition of open-ended REIFs to the office sector, the IPD office index was also interpolated on a monthly basis. These series exhibit very low short-term volatility and high levels of serial dependency, which is natural regarding their construction process.

Table 5-13 – Correlations for Nominal Returns

This table contains the contemporaneous correlation for real returns of all funds n the sample with data between Jun1994 and May2004. (**) Indicates a correlation coefficient significantly different from zero, at the 5% level.

Real Return Correlations – Jun1994 to May 2004

	OE2	OE5	OE8	OE9	OE10	CE2	CE4	CE5
OE2	1	0,875(**)	0,843(**)	0,510(**)	0,656(**)	-0,111	-0,025	-0,069
OE5	0,875(**)	1	0,847(**)	0,552(**)	0,770(**)	-0,159	-0,045	-0,113
OE8	0,843(**)	0,847(**)	1	0,505(**)	0,720(**)	-0,214(*)	-0,015	-0,083
OE9	0,510(**)	0,552(**)	0,505(**)	1	0,461(**)	-0,023	-0,054	-0,066
OE10	0,656(**)	0,770(**)	0,720(**)	0,461(**)	1	-0,184(*)	-0,049	-0,147
CE2	-0,111	-0,159	-0,214(*)	-0,023	-0,184(*)	1	0,052	0,053
CE4	-0,025	-0,045	-0,015	-0,054	-0,049	0,052	1	0,436(**)
CE5	-0,069	-0,113	-0,083	-0,066	-0,147	0,053	0,436(**)	1

Nevertheless, these characteristics are in line with previous findings regarding the nature of real estate returns. Also, this fact would not be relevant for correlation analysis of a long series with a significant trend. In any case, for a more exhaustive and sustained analysis, quarterly and half yearly compounded return time series were also constructed for result comparison.

Contemporaneous and lagged correlation analysis was made for monthly and quarterly returns. This analysis was restricted to nominal returns for both open and closed-ended

funds. The maximum lag and lead considered was of 6 months for monthly returns and one year for quarterly returns. Results presented in Tables 5-14 and 5-15 and in appendix show that in general there are high levels of positive correlation, either contemporaneous or lagged, with the IPD indexes, either with the general market index, the office index or even with both, thus traducing a high explanatory power from these variables. However, some funds show no evidence of correlation, mostly the same with the most volatile and industry uncorrelated behaviour, which again suggests some level of singularity in fund behaviour.

Despite the reduced number of references to the use of macroeconomic variables as explanatory variables of property fund performance, probably due to their causal distance, there is a primary intuitive relation that may be established between these variables and property income and capital returns nature. Hence, in this study the macroeconomic indexes of gross domestic product (GDP) variation, internal demand (ID) variation and the production of the construction industry (PCI) were marginally investigated as potentially conditional of fund returns. The activity of space lease, which is behind the main component of core property investment return – lease activity income return may be conditioned or related to GDP variation, as an obvious primary indicator of macro environmental behaviour. Nonetheless GDP variation may be based more on ID or on external trade, which has quite different economical implications. For instance, variations of internal consumption could affect in a higher degree the retail sector, while the office and industrial sectors may be equally affected by changes in internal and external trade. Cyclic activity of building development also should be related to expectations of space demand, capital appreciation and rental income. Contemporaneous and lagged correlation analysis was made for quarterly nominal returns for open-ended

funds[49] with a maximum lag of one year. The results presented in appendix, show little explanatory power from these variables, in general terms, which may either suggest the possibility of a longer lead/lag relationship or the minor relevance of the potential direct interrelationship previously supposed.

Table 5-14 – Correlations between Nominal Returns of Open-ended Funds and the IPD indexes

	Correlation	OE1	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
Monthly	IPD	0,329	0,449	0,173	0,032	0,513	0,227	0,136	0,447	0,027	0,639
Returns	IPD Office	0,162	0,352	-0,032	0,471	0,737	0,192	0,160	0,559	0,005	0,603
Quarterly	IPD	0,566	0,633	0,152	0,098	0,596	0,355	0,249	0,503	0,050	0,777
Returns	IPD Office	0,328	0,452	-0,043	0,546	0,798	0,341	0,314	0,629	0,031	0,733
Half Yearly Returns	IPD	0,375	-0,014	0,297	0,651	0,079	-0,066	0,590	0,033	0,782	-0,985
	IPD Office	0,933	0,526	0,802	0,941	-0,120	0,195	0,965	0,838	0,885	-0,685

Table 5-15 – Correlations between Nominal Returns of Closed Ended Funds and the IPD indexes

	Correlation	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8
Monthly	IPD	-0,625	-0,150	0,069	0,047	-0,012	0,210	0,426	0,246
Returns	IPD Office	-0,718	0,148	-0,007	0,058	-0,034	0,087	0,759	0,666
Quarterly	IPD	-0,828	-0,154	0,255	0,068	-0,051	0,343	0,487	0,282
Returns	IPD Office	-0,925	0,252	0,134	0,098	-0,080	0,154	0,836	0,752
Half Yearly Returns	IPD	-0,043	-0,303	0,313	-0,398	0,122	0,780	0,711	0,763
	IPD Office	0,287	0,273	0,064	0,456	0,353	0,898	0,760	-0,126

[49] In this case, open-ended funds have most of their portfolio in core investments, hence more exposed to the activity of space leasing.

5.1.5 Persistence

Although in more efficient and liquid market such as stocks or bonds it is not straightforward for investors to use past information to predict future performance (Fama, 1970), it seems to be compelling for most investors to relate to the past when deciding on future investment action. Scientific support for this behaviour includes some empirical evidence which indicates that security returns may be predictable over short horizons (e.g. Grinblatt *et al.,* 1989).

However, in the real estate market, as previously described in Chapter 3, there is vast empirical evidence suggesting a high predictability level of direct property returns. In particular, authors like Devaney *et al.* (2004), Lee and Ward (2000), Lee (2003), and Lin *et al.* (2004) found strong evidence of persistency in direct real estate returns, over long periods, thus suggesting that the use of information on past performance is rather important for future investment decisions. This importance depends heavily on the level of relation between the performance of successive periods and its stability over time.

Predictability phenomena in direct real estate indices are largely connected to its appraisal based nature. Another way to look at it is by recognizing that in any transaction, price construction is not totally exogenous to the parts involved. All the causes and consequences of effects like appraisal smoothing can be obviously connected to predictability.

Performance persistence refers to evidence of systematic tendency for over or under performance relative to a given reference or index. It can be defined through various criteria and analyzed with different methodologies.

In other words, it is all about determining whether the best-performing investments in the past (or winners) are likely to remain the best-performing investments in the future.

The purpose of the study here described is to investigate the extent and implications of serial persistence in the Portuguese REIF market. REIFs are indirect investment vehicles but their pricing and return are appraisal based, as previously described. In REIFs however there is still an extra bias factor – management valuation. Two fundamental issues can be raised: the existence of persistence in short or long periods in absolute term and the comparison of the REIF reality with independently valued index realities.

As previously described in Chapter 3, the principal methodologies used for this purpose include regression analysis, in which future performance is regressed against a measure of performance in the past, the ranking of the return into percentiles and consequent statistical evidence of deviation from the theoretical probability of remaining in the same percentile for the subsequent period, and finally contingency tables that consist in a non-parametric approach in which indexes or other are classified as winners and losers over successive periods whether their performance is above or below the reference performance (usually the median performance), or some other.

In this study, the methodology used to evaluate persistence is the winner-loser contingency table. It was preferred to other methodologies both for structural reasons and for its simplicity. According to Lee (2003), the use of contingency tables is more suitable where there is uncertainty regarding the distributional hypothesis of the sample and when the sample number is limited. As in most studies of direct or appraisal based real estate indices, previous evidence shows non-normality and heterogeneity of the REIF return time series data thus proving this as the most recommendable option. Added to this, there is the evident simplicity of use of contingency tables.

The contingency table method is based on the funds classifications as winners and losers in a series of successive time periods. A winner (**W**) in a given period is defined as a fund with returns above the median in that period and correspondently a loser (**L**) is defined as a fund with returns below the median. If a fund is a loser (**L**) in the $\mathbf{(i-1)^{th}}$ period and also

a loser (**L**) in the **i**th period, it is defined as a loser-loser (**LL**) in the **i**th period, or in other words a fund that has remained a loser. In a similar manner, classifications of winner-winner (**WW**), loser-winner (**LW**) and winner-loser (**WL**) can be defined according to Table 5-16. This approach is valid for a varying set of funds along the successive periods. In any case, each fund will only be classified in $\mathbf{n_f}$**-1** periods as either **WW**, **WL**, **LW** or **LL**, where $\mathbf{n_f}$ is the number of time periods for which return data is available for that fund.

Table 5-16- Winner/Loser Contingency Table

		Period i	
		Winner	Loser
Period i-1	Winner	WW	WL
	Loser	LW	LL

The next step is an analysis of the frequencies of each category for the whole series of time periods. If the results were independent, or in other words, the fact of a fund being a winner or loser in a period would not imply anything about its classification in the next period, the probability of occurrence of each of the four states (**WW**, **WL**, **LW** and **LL**) would be the same. Therefore, to test independence is to evaluate these frequencies and look for statistical evidence of difference against expected results.

Three statistical criteria were used, each providing a different sort of persistence evidence. The first statistical test concentrates on the evaluation of the repeat winner ("hot hands") or repeat loser ("cold hands") phenomenon (Malkiel, 1995). The test on "hot hands" shows the proportion of repeat winners (WW) to winner-losers (WL) and reciprocally the test on "cold hands" the proportion of repeat losers (**LL**) to loser-winners (**LW**). If p is the probability that a winner (loser) in one period continues to be a winner (loser) in the subsequent period, a value of p less than or equal to 0,5 indicates no persistence of the winner-winner (loser-loser) situation. To test the significance of the

proportion ***p*** of the number ***Y*** of **WW** (or **LL**) to the total number **n** of occurrences WW+WL (or LL+LW), a binomial test of ***p>1/2*** can be performed using the test statistic Z defined by equation(5-6):

$$z = (Y - np) / \sqrt{np(1-p)} \qquad \textbf{(5-6)}$$

The test statistic Z is approximately normally distributed with zero mean and standard deviation one, when t is greater than 20. Thus, a percentage **p** above 50% and a Z-statistic above zero are indicative of performance persistence, while a percentage value below 50% and a Z-statistic above zero indicate a reversal in performance.

The second approach is based on the Cross-Product Ratio (CPR) (Fienberg, 1980). The CPR test statistic is defined by equation (5-7):

$$CPR = \frac{WW \times LL}{LW \times WL} \qquad \textbf{(5-7)}$$

A CPR equal to one means that the performance in one period is unrelated to that in the previous. A CPR greater than one is an indicator of persistence ("hot hands" and/or "cold hands"), while a value below one indicates that reversals in performance dominate the sample. The statistical significance of the CPR can then be determined by using the Z statistic

$$Z = \frac{\ln(CPR)}{\sigma_{\ln}(CPR)} \qquad \textbf{(5-8)}$$

which for large samples is normally distributed (see Christensen, 1990) with mean $\ln(CPR)$ and the standard deviation given by:

$$\sigma_{\ln(CPR)} = \sqrt{\frac{1}{WW} + \frac{1}{LL} + \frac{1}{WL} + \frac{1}{LW}} \quad \textbf{(5-9)}$$

The last test used to test independence is the chi-square statistic (see Kahn *et al.,* 1995). The chi-square statistic is calculated as indicated in equation (5-10):

$$\chi^2 = \frac{(\text{WW-D1})^2}{\text{D1}} + \frac{(\text{WL-D2})^2}{\text{D2}} + \frac{(\text{LW-D3})^2}{\text{D3}} + \frac{(\text{LL-D4})^2}{\text{D4}} \quad \textbf{(5-10)}$$

where ***N*** is the total number of occurrences and the frequencies ***D1***...***D4*** are

$$D1 = \frac{(WW + WL) \times (WW + LW)}{N}; D2 = \frac{(WW + WL) \times (WL + LL)}{N};$$
$$D3 = \frac{(LW + LL) \times (WW + LW)}{N}; D4 = \frac{(LW + LL) \times (WL + LL)}{N} \quad \textbf{(5-11)}$$

In this case, in order to prevent overestimation of statistical significance for small data by the Chi squared test of independence in a contingency table, the Yates' correction for continuity, or Yates' chi-square test, was used (Yates, 1934). It is designed to tackle the problem of a chi-square test having the assumption that the discrete probability of observed frequencies can be approximated by the continuous chi-squared distribution. Yates presented a correction for continuity which adjusts the formula for Pearson's chi-square test by subtracting 0,5 from the difference between each observed value and its expected value in a 2×2 contingency table. This reduces the chi-square value obtained and thus increases its p-value. For the present case the Yates correction would transform the chi-square test as defined in equation (5-12):

$$\chi^2_{Yates} = \frac{(|\text{WW-D1}|-0.5)^2}{\text{D1}} + \frac{(|\text{WL-D2}|-0.5)^2}{\text{D2}} + \frac{(|\text{LW-D3}|-0.5)^2}{\text{D3}} + \frac{(|\text{LL-D4}|-0.5)^2}{\text{D4}} \quad \textbf{(5-12)}$$

Yates correction is essentially used when a category has a low expected frequency, which is less than 5 for some sources and less than 10 for others. However, other sources say

that Yates corrections should always be applied as they are conservative (see e.g. Stefanescu *et al.,* 2005). Nonetheless, in situations with large sample sizes, using the correction will have little effect on the value of the test statistic, and hence the p-value obtained.

In this study, two main levels of analysis were considered: the global fund level and the individual fund level. At the global fund level the aim is to find evidence that may lead to conclude that performance persistence is or is not a fundamental characteristic of REIF in general. Therefore, each one of these tests was used for persistence analysis on different base unit periods: monthly, quarterly, half-yearly, yearly and biannual. The monthly returns were compounded to produce returns at quarterly, half-yearly, one and two-yearly intervals. Due to the sample size no larger period returns were considered because the significance of the results would be meagre. The analysis was developed on the overall sample and also on the subclass samples, namely of open-ended and/or of closed-ended funds. Correspondently the funds in each case were defined for each period as winners or losers whether they were respectively above or below the sample's median.

This analysis provided results regarding the existence of different types of short and long term performance persistence, as presented in Tables 5-17 to 5-19.

Table 5-17 presents the results for the overall sample of funds. It shows strong evidence of both short and long term performance persistence. For every test that was used here, the results indicating the systematic existence of persistent winners and persistent losers are extremely significant in a statistical sense. The only apparent exception was the analysis on the 2 year base period, where, due to the short number of observations, results failed to be more significant on the "cold hands" side, but in any case a strong suggestion of this phenomenon can be supported just from the observed frequencies.

The use of Yates's continuity correction to the Chi-square statistic tests appears to be only relevant for the 24 months period, where small sample bias may indeed exist.

Despite the fact that in all cases the p-values are higher than without the correction, which was certainly expected for the reasons explained before, the changes are minor in most cases and only significant for the longer period. However, even in this case the conclusions drawn before on the existence of strong evidence of persistence do not change at all. This fact points to the conclusion that in general when addressing the REIF industry, the common investor should be careful to choose investments or funds that have performed well in the past, even if acting in a long term perspective. This is bound to have a strong connection with the use of appraisal based return measures and with the existence of managerial bias in valuations. This evidence is in line with previous research in other realities like Lee (2003) and other referred before.

These results are repeated in a parallel way for open-ended funds, which show highly significant evidence of persistence phenomena both for short and long evaluation periods. Again persistent winners and persistent losers are greatly significant in a statistical sense in all evaluation periods, being the only exception the biannual, due to the small number of observations. However, for closed-ended funds, the results are not at all identical. There is evidence of short term persistence (at the one and three months basis) but in a longer term the indications of performance persistence are thinner and only truly relevant for the "cold hands" phenomena, or in other words, the only strong evidence is that poorly performing funds in a period will most probably maintain its relative performance in future periods. This difference may result from the main structural and regulatory differences between these two classes of funds which affect size, portfolio structure, types of operations and management perspective. Naturally, closed ended funds are in average smaller than open-ended ones and usually include more non-core or core-plus investments. Secondly, the management has fewer constraints on its position and practice regarding frequency and criteria of current property valuation updates, being naturally more concerned with the fund's situation on maturity. This may lead to great practical

differences in the reality reflected by return measures. Finally, closed-ended funds have fewer constraints on financial leveraging, which can also have a great impact on the overall portfolio, especially for larger projects.

At the individual fund level, the aim was to find evidence that may lead to conclude persistence performance of any kind for each of the funds in the sample. The contingency tables of performance persistence of individual funds are presented in appendix. The results include only the repeat winner and repeat loser test, due to its more suitable and informative nature in this case. In fact other tests like the CPR are even inappropriate for testing the persistence of individual funds (Lee, 2003).

The analysis was developed only for quarterly, semi-annually and annual periods of measurement because of the statistical difficulties of providing reliable results with limited data over longer evaluation periods. Again two types of reference universes were used – the overall sample, thus aiming at finding evidence of persistence relative to the global fund universe, and fund segment samples (open-ended and closed-ended) in order to discover the same type of event only now relative to the sub universes. In fact, for instance, in the same period an open-ended fund may be a winner in its segment but a loser in the overall sample, thus evidencing two distinct realities.

Here again, confirming the results above, when considered individually, a large number funds exhibit systematic characteristics of superior or inferior persistence, or in other words are either systematic losers or systematic winners. In general, statistically significant evidence of short term persistence is much greater than long term persistence, which in many cases is purely a case of a small number of observations. In some cases, funds show evidence of being simultaneously repeat winners and repeat losers in short term performance, which indicates that these funds reverse from short continued periods (1 to 6 months) of being winners to short continued periods of being losers.

Nevertheless, for open-ended funds, the 3 dividend distributing REIFs (OE8,9 and OE10) are generally persistent winners in a statistically significant sense, in both short and long term analysis. Statistical evidence also shows one open-ended fund (OE5) to be a persistent loser in all periods. In a less rigorous scrutiny, funds O1 and OE7 show faltering evidence of above-the-line repeated performance and funds OE2,OE3, OE4 and OE6 a leaning for being repeated losers. There is little difference in results when changing from the global universe to the class universe, hence an open-ended repeat winner (loser) is a repeat winner (loser), no matter what the reference is.

For closed-ended, the results show more differences between the global fund sample and the class sample and also less evidence of generalized persistence. Two closed ended (CE7 and CE8) are generally persistent losers in a statistically significant sense, in both short and long term analysis, especially when included in the overall sample. Statistical evidence also shows CE4 to be a persistent winner in all periods but only when considering the overall sample. Other persistency indication can be only obtained for short evaluation periods, especially monthly. The reasons behind this fact are probably the same pointed to above in the global level analysis.

Table 5-17 – General Persistency Tests for the Overall Sample of Funds

This table present contingency tables and persistence tests restricted to the Jun1994May2004 varying overall sample of funds, considering monthly, quarterly, half-yearly, yearly and biannual evaluation periods were the monthly returns are compounded to produce returns at quarterly, half-yearly, one and two yearly intervals. Repeat winners (Hot Hands and repeat losers tests, CPR test and Chi-Square tests are used and p-values of the test statistics are determined. Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively .

Period of Evaluation		1 month	3 months	6 months	1 Year	2 Years
Number of LL		587	185	84	41	16
Number of LW		184	60	32	13	6
Number of WL		179	64	37	16	9
Number of WW		535	160	76	39	17
Total		1485	469	229	109	48
"Hot Hands"	**p**	74,93%	71,43%	67,26%	70,91%	65,38%
	z	**13,323*****	**6,414*****	**3,669*****	**3,101*****	1,569
	p-value	**0,000**	**0,000**	**0,000**	**0,002**	0,117
"Cold Hands"	**p**	76,13%	75,51%	72,41%	75,93%	72,73%
	z	**14,514*****	**7,986*****	**4,828*****	**3,810*****	**2,132****
	p-value	**0,000**	**0,000**	**0,000**	**0,000**	**0,033**
CPR		9,535	7,708	5,392	7,688	5,037
Sigma		0,121	0,210	0,289	0,435	0,632
Z-test		**18,666*****	**9,742*****	**5,836*****	**4,686*****	**2,559*****
p-value		**0,000**	**0,000**	**0,000**	**0,000**	**0,010**
χ^2		**387,049*****	**103,521*****	**36,149*****	**23,958*****	**6,936*****
p-value		**0,000**	**0,000**	**0,000**	**0,000**	**0,008**
χ^2 Yates		**385,007*****	**101,645*****	**34,575*****	**22,117*****	**5,493****
p-value		**0,000**	**0,000**	**0,000**	**0,000**	**0,019**

Table 5-18 – Persistency Tests for the Sample of Open-ended Funds

This table present contingency tables and persistence tests restricted to the Jun1994May2004 varying sample of open-ended funds, considering monthly, quarterly, half-yearly, yearly and biannual evaluation periods were the monthly returns are compounded to produce returns at quarterly, half-yearly, one and two yearly intervals. Repeat winners (Hot Hands and repeat losers tests, CPR test and Chi-Square tests are used and p-values of the test statistics are determined. Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively .

Period of Evaluation		1 month	3 months	6 months	1 Year	2 Years
Number of LL		358	117	52	28	8
Number of LW		86	26	15	3	3
Number of WL		84	27	17	5	5
Number of WW		310	91	43	24	10
Total		838	261	127	60	26
"Hot Hands"	**p**	78,68%	77,12%	71,67%	82,76%	66,67%
	z	**11,386*** **	**5,892*** **	**3,357*** **	**3,528*** **	1,291
	p-value	**0,000**	**0,000**	**0,001**	**0,000**	0,197
"Cold Hands"	**p**	80,63%	81,82%	77,61%	90,32%	72,73%
	z	**12,909*** **	**7,610*** **	**4,520*** **	**4,490*** **	1,508
	p-value	**0,000**	**0,000**	**0,000**	**0,000**	0,132
CPR		15,363	15,167	8,769	44,800	5,333
Sigma		0,172	0,308	0,410	0,781	0,871
Z-test		**15,892*** **	**8,820*** **	**5,298*** **	**4,865*** **	**1,922***
p-value		**0,000**	**0,000**	**0,000**	**0,000**	**0,055**
χ^2 Test		**294,628*** **	**90,800*** **	**30,979*** **	**32,333*** **	**3,939*** **
p-value		**0,000**	**0,000**	**0,000**	**0,000**	**0,047**
χ^2_{Yates}		**292,253*** **	**88,432*** **	**29,025*** **	**24,174*** **	**2,521*** **
p-value		**0,000**	**0,000**	**0,000**	**0,000**	**0,112**

Table 5-19 – Persistency Tests for the Sample of Closed-ended Funds

This table present contingency tables and persistence tests restricted to the Jun1994May2004 varying sample of closed-ended funds, considering monthly, quarterly, half-yearly, yearly and biannual evaluation periods were the monthly returns are compounded to produce returns at quarterly, half-yearly, one and two yearly intervals. Repeat winners (Hot Hands and repeat losers tests, CPR test and Chi-Square tests are used and p-values of the test statistics are determined. Statistics in bold marked *,** and *** indicate significance at the 10%, 5% and 1% levels respectively .

Period of Evaluation		1 month	3 months	6 months	1 Year	2 Years
Number of LL		250	76	33	18	9
Number of LW		107	38	20	6	2
Number of WL		104	39	23	9	3
Number of WW		186	55	26	16	8
Total		647	208	102	49	22
"Hot Hands"	**p**	64,14%	58,51%	53,06%	64,00%	72,73%
	z	**4,815*****	**1,650***	0,429	1,400	1,508
	p-value	**0,000**	**0,099**	0,668	0,162	0,132
"Cold Hands"	**p**	70,03%	66,67%	62,26%	75,00%	81,82%
	z	**7,568*****	**3,559*****	1,786*	**2,449****	**2,111****
	p-value	**0,000**	**0,000**	0,074	**0,014**	**0,035**
CPR		4,179	2,821	1,865	5,333	12,000
Sigma		0,168	0,289	0,403	0,629	1,034
Z-test		**8,495*****	**3,593*****	1,548	**2,661*****	**2,403****
p-value		**0,000**	**0,000**	0,122	**0,008**	**0,016**
χ^2 Test		**75,385*****	**13,211*****	2,415	**7,528*****	**6,600*****
p-value		**0,000**	**0,000**	0,120	**0,006**	**0,010**
χ^2 Yates		**74,013*****	**12,212*****	1,836	**6,034****	**4,583****
p-value		**0,000**	**0,000**	0,175	**0,014**	**0,032**

5.2 CONCLUSIONS

REIFs are presently a major player in land and urban space development in Portugal. In order to perceive the real characteristics of REIFs' recent performance and to assess which way they are related to structural and regulatory issues, a detailed time analysis was designed and developed, aiming at establishing a basis for future research on performance prediction and attribution models. Accordingly, in this chapter the results of the methodology established on the basis of previous research for attaining these objectives were presented, which included trend and descriptive statistics analysis, return distribution analysis, variable interrelationship analysis at the class and fund levels and finally, analysis of short and long term performance persistence.

From the results presented in this paper regarding time series analysis, descriptive statistics of returns, there is evidence of behavioural heterogeneity across the industry and even within its subsectors, pointing to the importance of endogenous factors at the fund level in performance explanation and a potential fund mispricing through discretionary management individual criteria. This is apparently more significant than common real estate fund mispricing due to sparse appraisals (Redding, 2006). In fact, the framework for the calculation of the fund's NAV provides an additional level of subjectivity regarding the valuation of property assets besides the common appraiser's level, which is manager's level. This suggests *a priori* an eventual relevant influence of managerial property asset valuation criteria in return series behaviour.

Various levels of analysis were covered. Structural differences in the nature of open-ended and closed-ended funds may justify the evidence found in differences in return variation. These relate to the portfolio structure, with the first typically incorporating mostly core investment strategies while the latter include a large percentage of value added or opportunistic investments, but also to property valuation criteria in view of

different liquidity constraints. Within open-ended funds, there is no evidence of a direct implication of structural difference of behaviour between dividend and growth funds. Despite this fact, there are significant behavioural differences at the individual fund level. Some funds display a larger tendency for discrete high positive peak values, thus to an asymmetrical behaviour, others a much smoother evolution. For the closed-ended fund set there is even greater evidence of individuality and again no apparent bunching by dividend policy class. High volatility, high tendency for discrete high positive peak values and asymmetrical behaviour are here more the rule than the exception. This can be explained by valuation bunching or very sparse effective portfolio revaluations.

Descriptive statistics for nominal and real returns in open-ended funds exhibit very low volatility, revealing smoothing of base property valuations. This result is in line with Lee *et al.* (2000) for the direct UK market. As for return distributions, evidence of non-normality is rather overwhelming, in line with the findings of Myer *et al.* (1991), Byrne *et al.* (1997), Maurer *et al.* (2004) and Coleman *et al.* (2005) on appraisal based property indexes of other market. However, there is not a regular pattern either for the type of deviations from normality encountered, which again reinforces the idea of a prevalence of singular behaviour due to endogenous and intangible factors. Open-ended funds exhibit in general very high, and continuous levels of autocorrelation at any lag up to 13 months, which is not consistent with the results presented in Lee *et al.* (2000), where autocorrelations were relevant but dropped for non significant values at the one year lag. This suggests that Portuguese open-ended funds seem to present a greater and longer serial dependence of returns than general valuation based indices, which may be due to a very long period between consecutive appraisals but also to excessive managerial smoothing/ influence on the final property valuations reported to the CMVM. Also, open-ended funds exhibit very high levels of cross-correlation between them, which reveals a

very strong intra-industry resemblance between investment strategies and return evolution.

Evidence presented of high levels of positive correlation of open-ended funds' returns, either contemporaneous or lagged, with the IPD indexes, either with the general market index, the office index or even with both, indicates a high explanatory power from these variables, although in rather different terms from fund to fund. However, macro economic variables such as GDP variation, ID variation and PCI show little explanatory power, in general terms, for the lags up to one year, either suggesting an eventual longer lead/lag relationship or the actual inexistence of any potential direct interrelationship.

Closed ended funds, however, present very low levels of autocorrelation, not significant in a statistical sense. This evidence is related to the more pronounced random nature of their monthly returns presented before, and to the tendency for a fat-tailed nature of their distributions. Also, there is almost no observable correlation between the returns of different closed ended funds. This reveals behavioural individuality, which can be based on structural reasons, mainly related to the fact of these funds including value added and opportunistic investments in their portfolios, but also to very sparse, non periodic, effective property revaluation for NAV calculation.

Also presented in this chapter is strong evidence of both short and long term performance persistence within the overall property fund industry. These results are repeated in a parallel way for the restricted universe of open-ended funds, which show highly significant evidence of persistence phenomena both for short and long-term evaluation. However, for the set of closed-ended funds, the results are not at all identical. There is evidence of short term persistence but in a longer term the indications of performance persistence are only truly relevant for the "cold hands" phenomena. This difference may result from the main structural and regulatory differences between these two classes of

funds. Closed ended funds are in average smaller than open-ended and usually include riskier investments, with the management having fewer liquidity and leveraging constraints and being naturally more concerned with the fund's situation on maturity, which may lead to great practical differences in the reality reflected by return measures.

Again, confirming the results above, when considered individually, a large number funds exhibit systematic characteristics of superior or inferior persistence, or in other words are either systematic losers or systematic winners. In general, statistically significant evidence of short term persistence is much greater than long term persistence, which in many cases is purely a case of a small number of observations. In some cases, funds show evidence of being simultaneously repeat winners and repeat losers in short term performance, which indicates performance reversion after short continued periods of persistence up to 6 months. There is little difference in results when changing from the global universe to the fund class universe, hence an open-ended repeat winner (loser) is a repeat winner (loser) no matter what the reference is. For closed-ended, the results show more differences between the global fund sample and the class sample and also less evidence of generalized persistence.

Results points to the conclusion that in general when addressing the REIF industry, the investor should generally consider choosing investments or funds that have performed well in the past, even if acting in a long term perspective. This evidence relates with previous research in other realities like Devaney *et al.,* (2004), Graff *et al.* (1999), Lee and Ward (2000) and Lee (2003), but it is worthy of notice that evidence of persistence within the Portuguese REIFs is much more significant than in any other cases, either for property funds in the UK or for appraisal based indexes in other markets.

This is bound to have a strong connection with the use of appraisal based return measures and with the existence of managerial bias in valuations, traducing considerable market

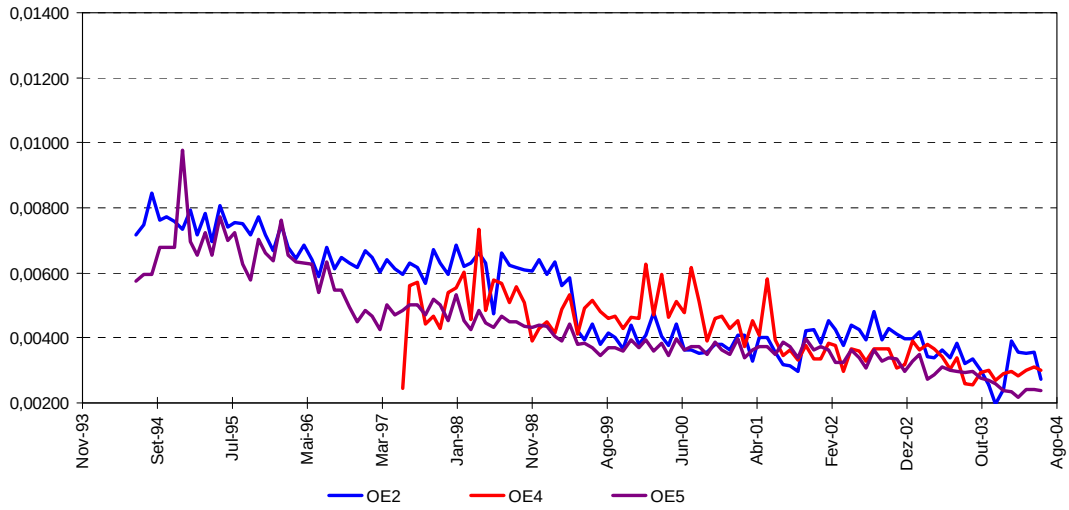
inefficiency. As the obvious final conclusion, both from performance persistence evidence presented and from the return distribution analysis, it should be pointed out that the usage of models that incorporate the assumption of serial independence and normal distribution of returns, such as the MPT or the CAPM are not suited and may be unreliable for the analysis and explanation of REIFs' return performance, thus justifying to an extent the results presented by Silva (2005).

APPENDICES

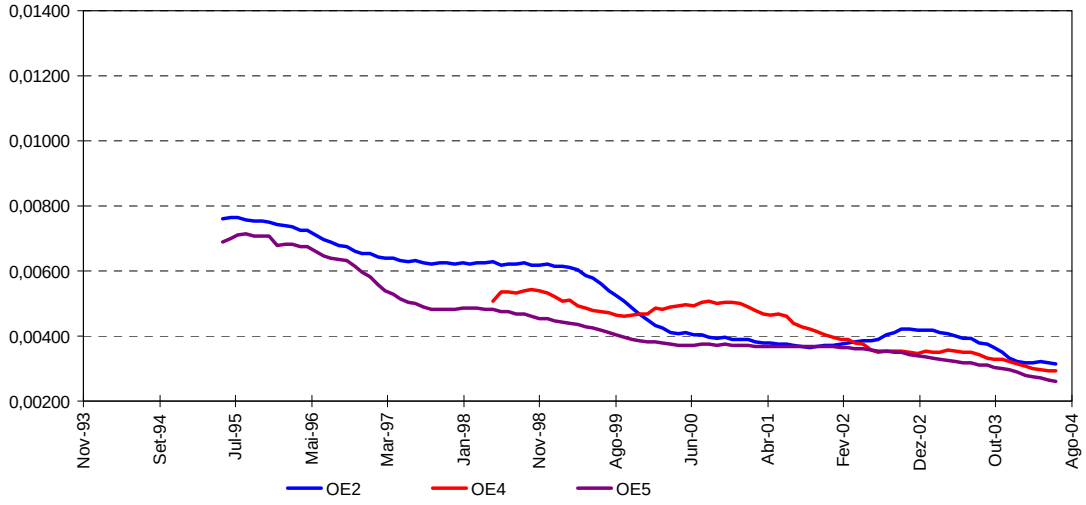
Appendix 5.1 - Scatter Plots for open-ended funds' nominal returns

The charts below present monthly nominal return time series of open-ended funds. Both raw returns (above) and twelve month moving averages (below) are presented for the same set of funds in one same pair of charts. This allows evaluation of short and long term behaviour. Funds were grouped according to the length of overall return series and the nature of their dividend policy. Vertical axis expresses total monthly total returns and the horizontal refers to the time scale.

MONTHLY NOMINAL TOTAL RETURNS (OE2,OE4 and OE5)

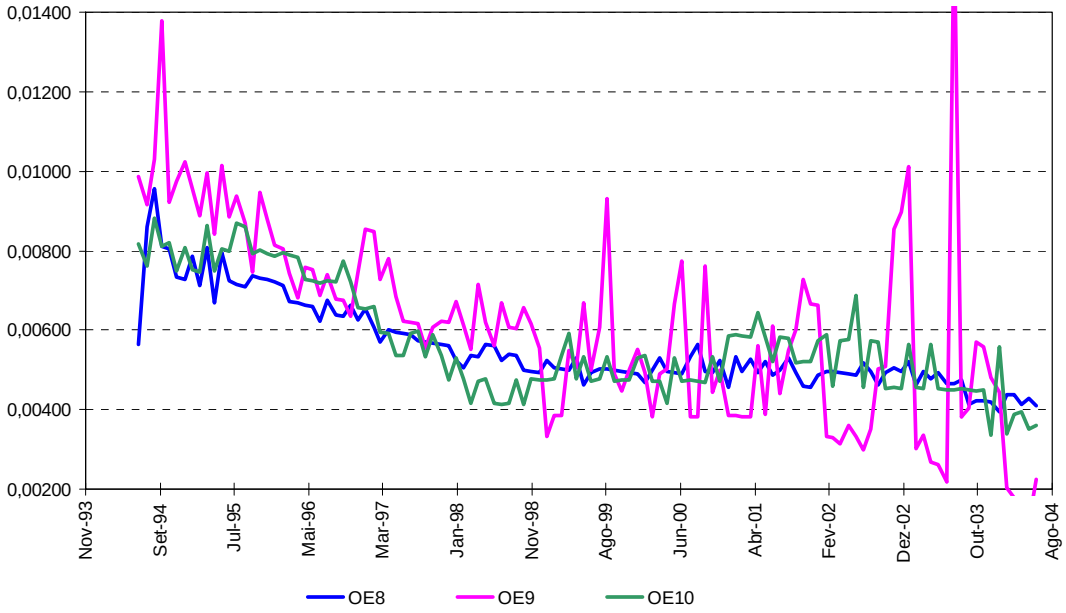


TWELVE MONTH MOVING AVERAGE OF NOMINAL MONTHLY TOTAL RETURNS (OE2,OE4 and OE5)

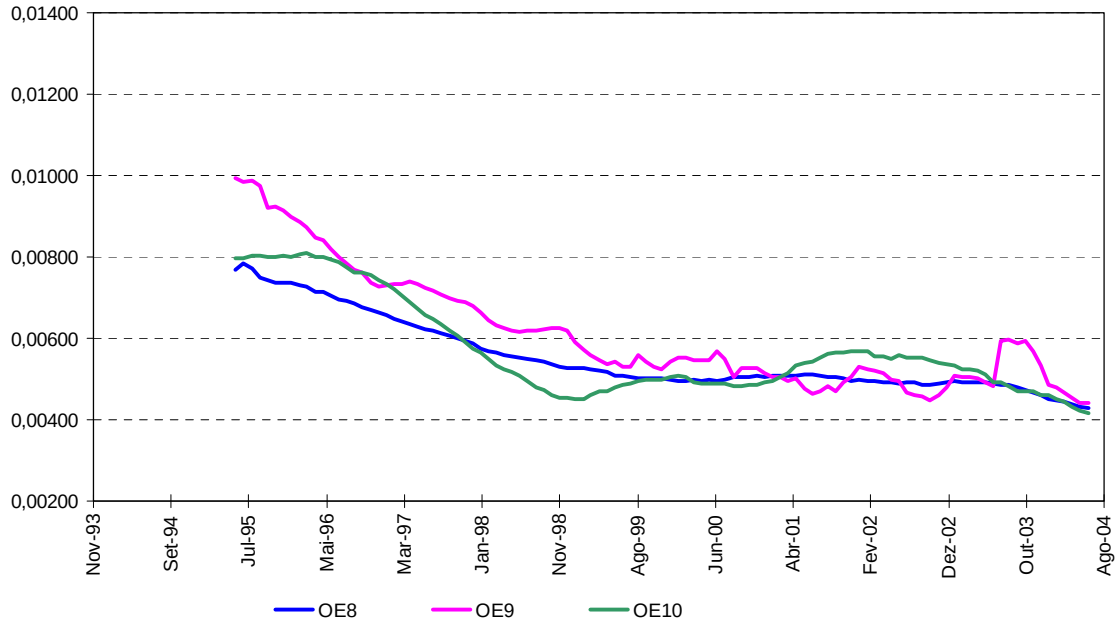


Appendix 5.1 - Scatter Plots for open-ended funds nominal returns (continued)

NOMINAL MONTHLY TOTAL RETURNS (OE8,OE9 and OE10)

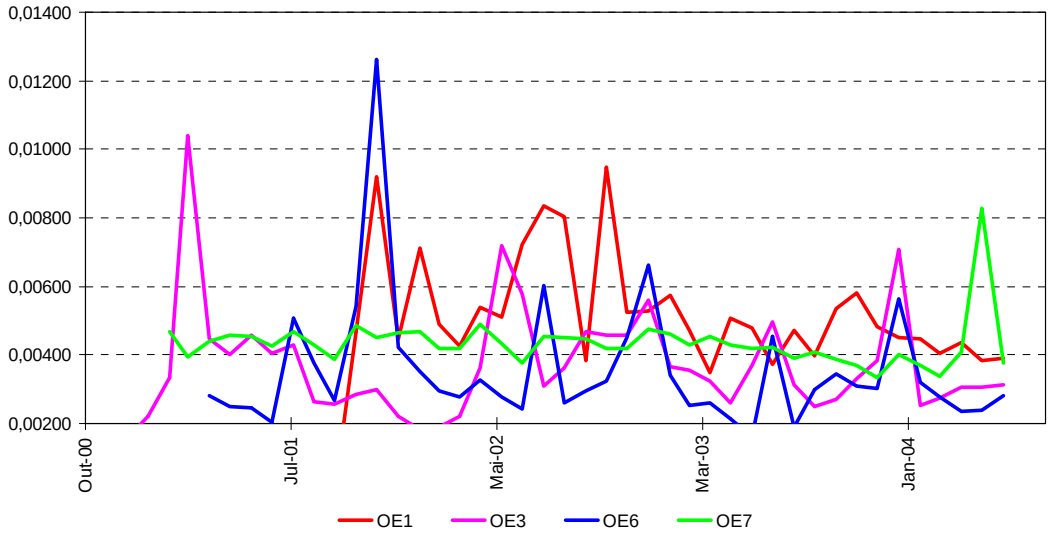


TWELVE MONTH MOVING AVERAGE OF RAW MONTHLY TOTAL RETURNS (OE8,OE9 and OE10)



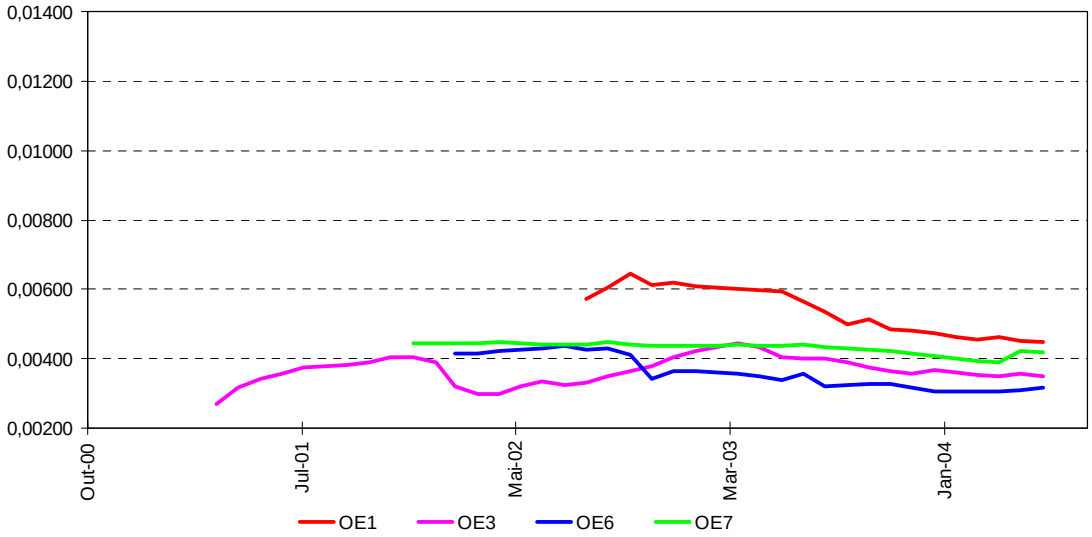
Appendix 5.1 - Scatter Plots for open-ended funds nominal returns (continued)

RAW MONTHLY TOTAL RETURNS (OE1, OE3, OE6 and OE7)



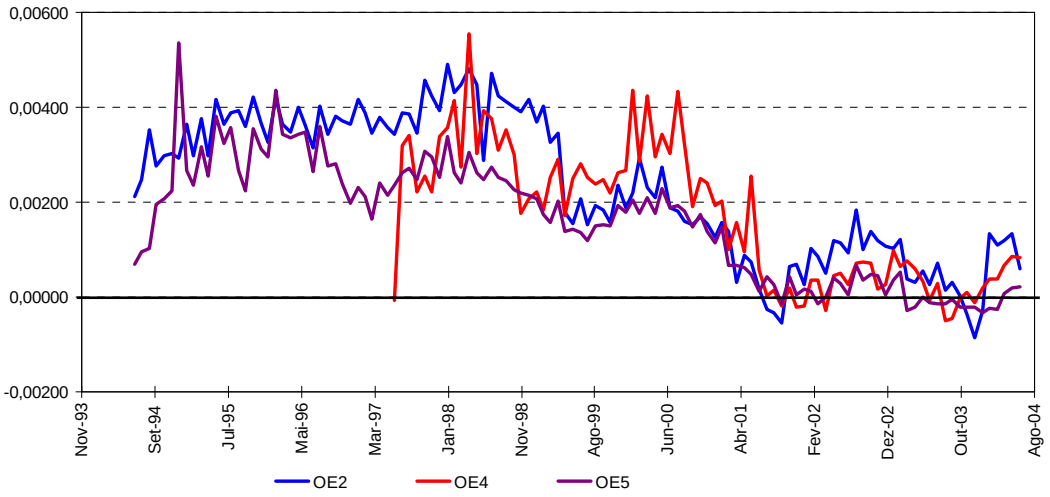
TWELVE MONTH MOVING AVERAGE OF RAW MONTHLY TOTAL RETURNS

(OE1,OE3, OE6 and OE7)

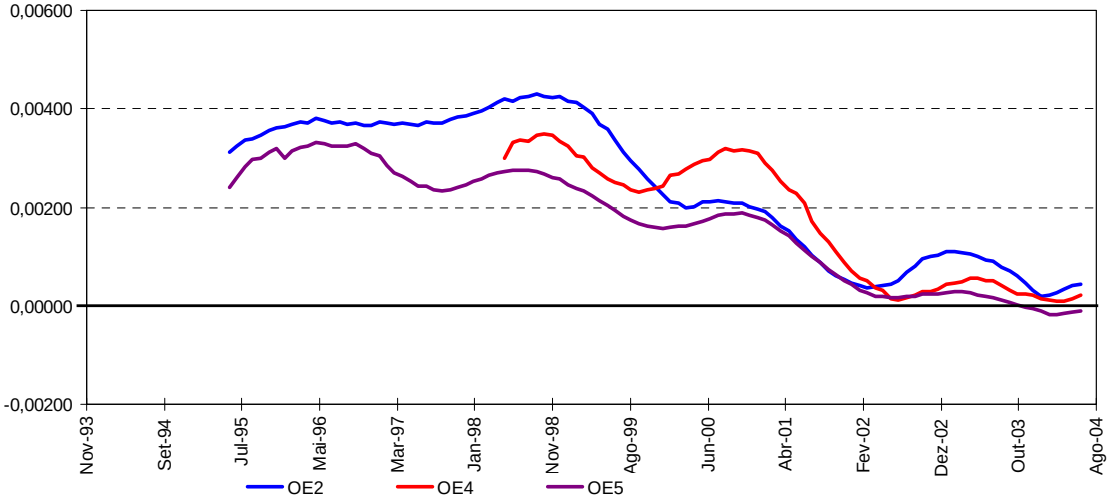


Appendix 5.2 - Scatter Plots for open-ended funds' real returns

The charts below present monthly real return time series of open-ended funds. Both raw returns (above) and twelve month moving averages (below) are presented for the same set of funds in one same pair of charts. This allows evaluation of short and long term behaviour. Funds were grouped according to the length of overall return series and the nature of their dividend policy. Vertical axis expresses total monthly total returns and the horizontal refers to the time scale.

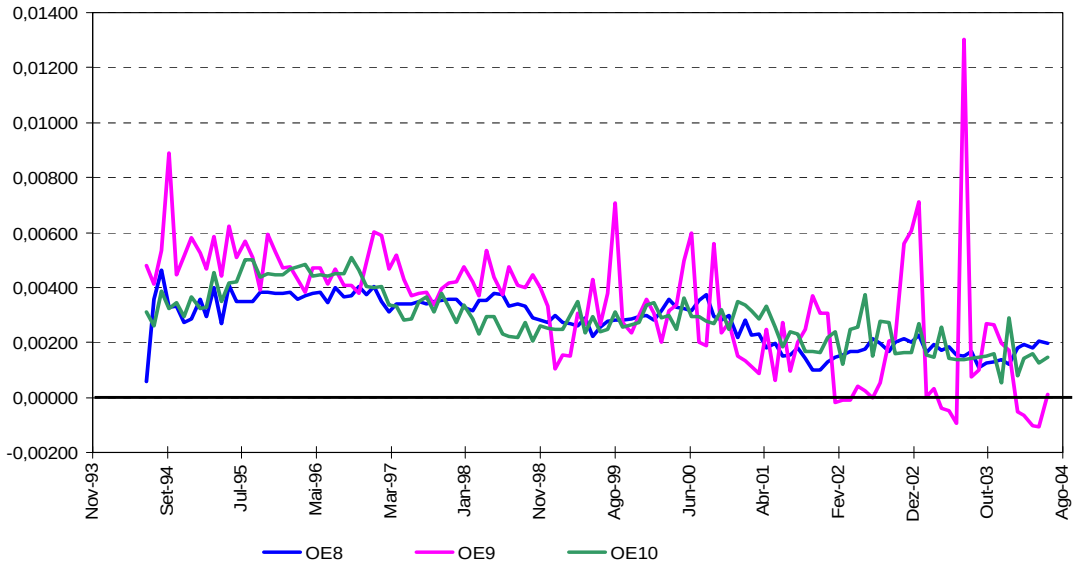


TWELVE MONTH MOVING AVERAGE OF REAL MONTHLY TOTAL RETURNS (OE2,OE4 and OE5)



Appendix 5.2 - Scatter Plots for open-ended funds' real returns (continued)

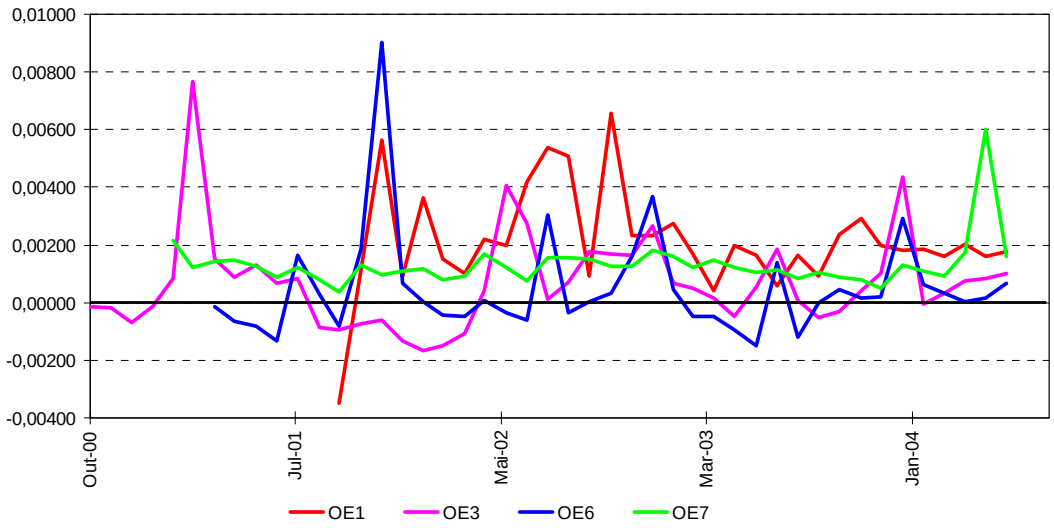
REAL MONTHLY TOTAL RETURNS (OE8,OE9 and OE10)



TWELVE MONTH MOVING AVERAGE OF RAW MONTHLY TOTAL RETURNS (OE8,OE9 and OE10)

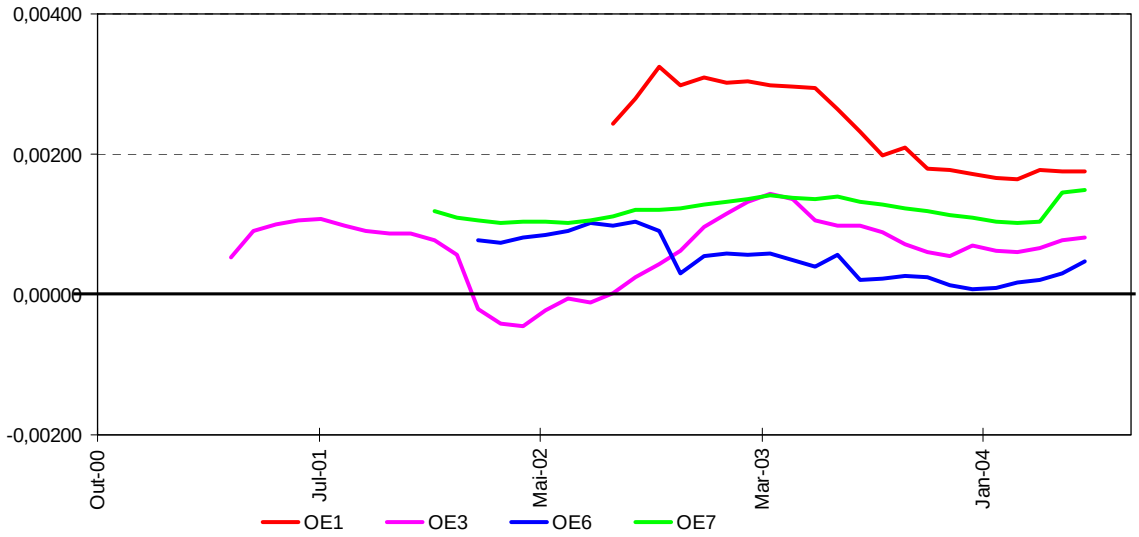
Appendix 5.2 - Scatter Plots for open-ended funds' real returns (continued)

RAW MONTHLY TOTAL RETURNS (OE1,OE3, OE6 and OE7)



TWELVE MONTH MOVING AVERAGE OF RAW MONTHLY TOTAL RETURNS

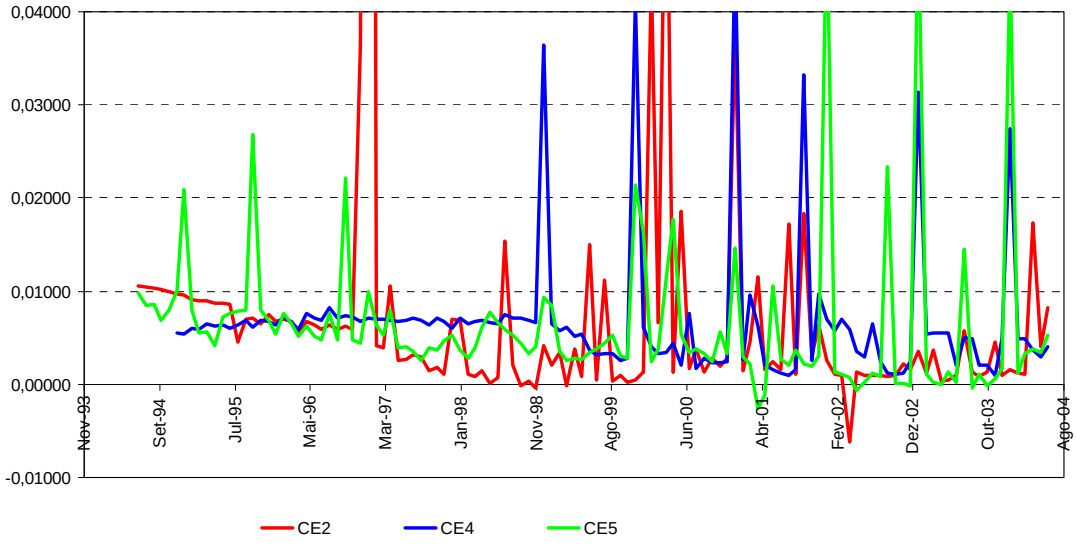
(OE1,OE3, OE6 and OE7)



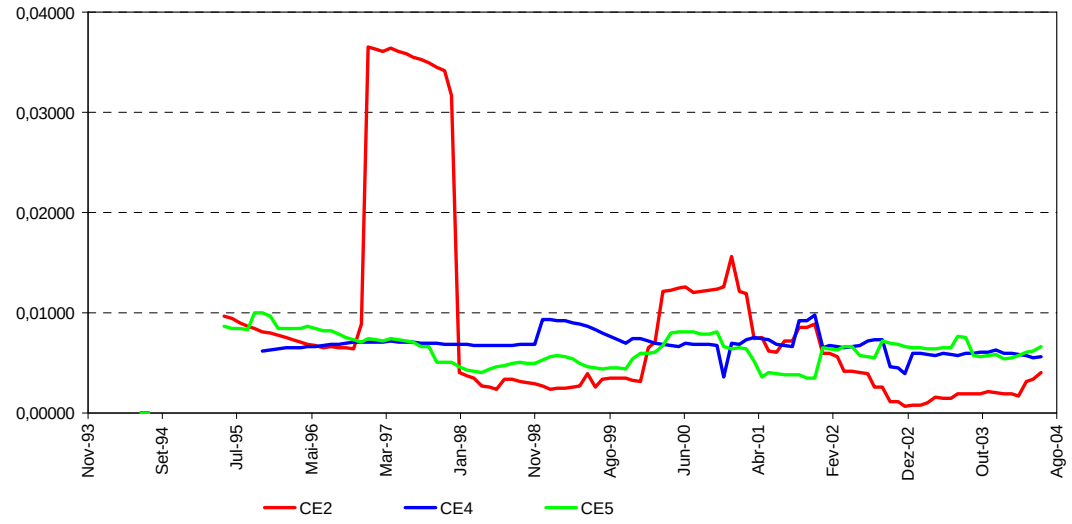
Appendix 5.3 - Scatter Plots for closed-ended funds' nominal returns

The charts below present nominal return time series of closed-ended funds. Both raw returns (above) and twelve month moving averages (below) are presented for the same set of funds in one same pair of charts. This allows evaluation of short and long term behaviour. Funds were grouped according to the length of overall return series and the nature of their dividend policy. Vertical axis expresses total monthly total returns and the horizontal refers to the time scale.

RAW MONTHLY TOTAL RETURNS (CE2,CE4, and CE5)

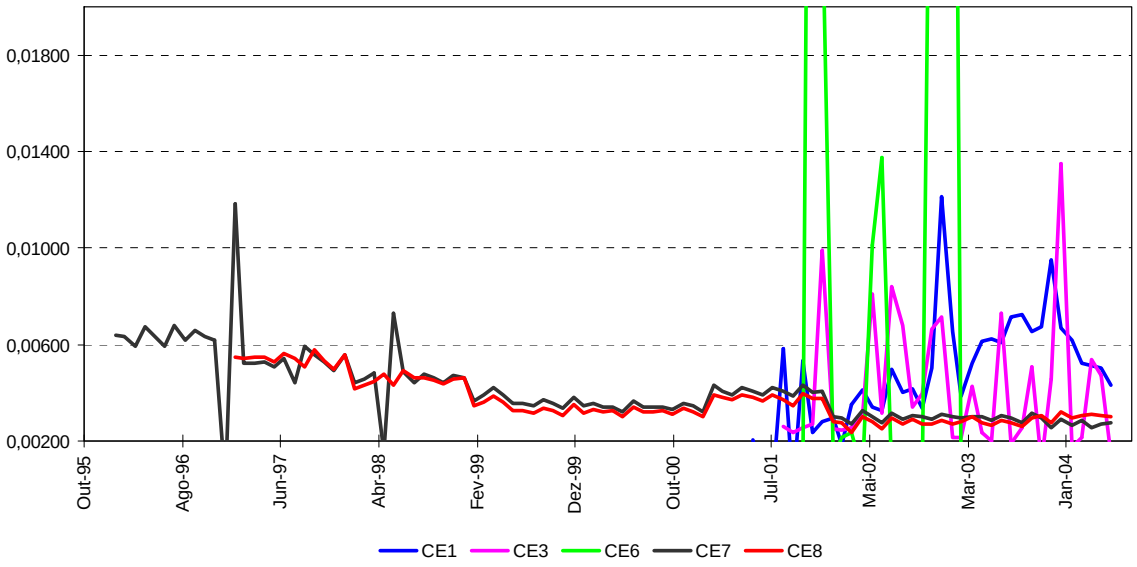


TWELVE MONTH MOVING AVERAGE OF RAW MONTHLY TOTAL RETURNS (CE2,CE4, and CE5)

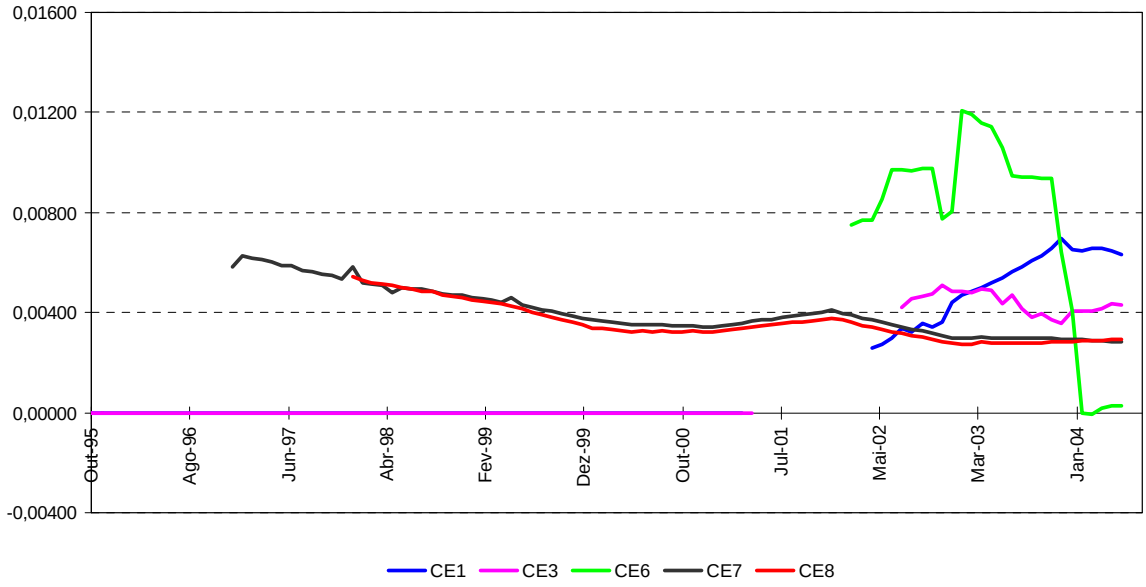


Appendix 5.3 - Scatter Plots for closed-ended funds' nominal returns (continued)

RAW MONTHLY TOTAL RETURNS (CE1, CE3, CE6, CE7, and CE8)



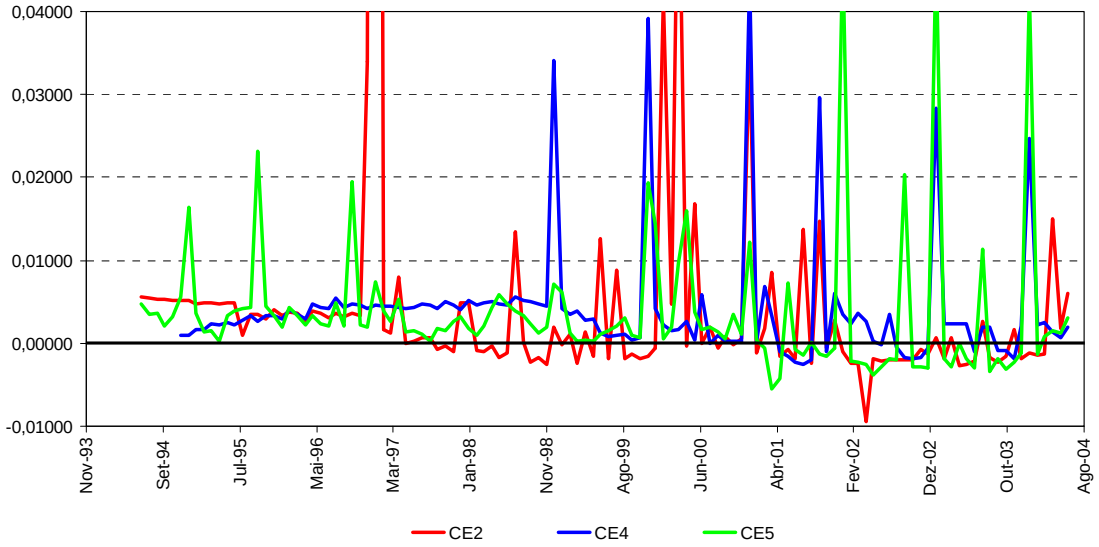
TWELVE MONTH MOVING AVERAGE OF RAW MONTHLY TOTAL RETURNS (CE1,CE3, CE6, CE7, and CE8)



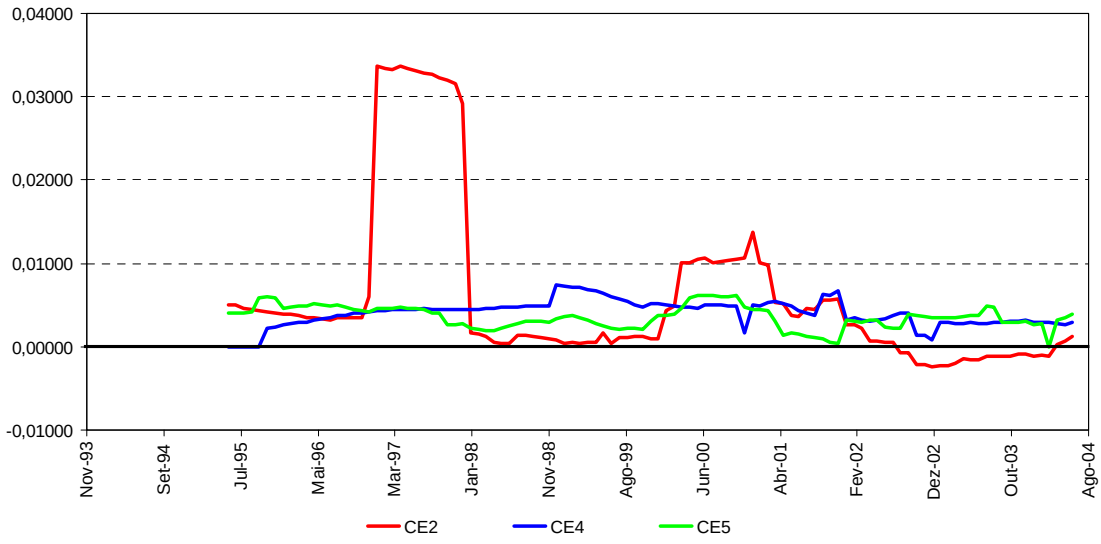
Appendix 5.4 - Scatter Plots for closed-ended funds' real returns

The charts below present real return time series of closed-ended funds. Both raw returns (above) and twelve month moving averages (below) are presented for the same set of funds in one same pair of charts. This allows evaluation of short and long term behaviour. Funds were grouped according to the length of overall return series and the nature of their dividend policy. Vertical axis expresses total monthly total returns and the horizontal refers to the time scale.

RAW MONTHLY TOTAL RETURNS (CE2, CE4, and CE5)

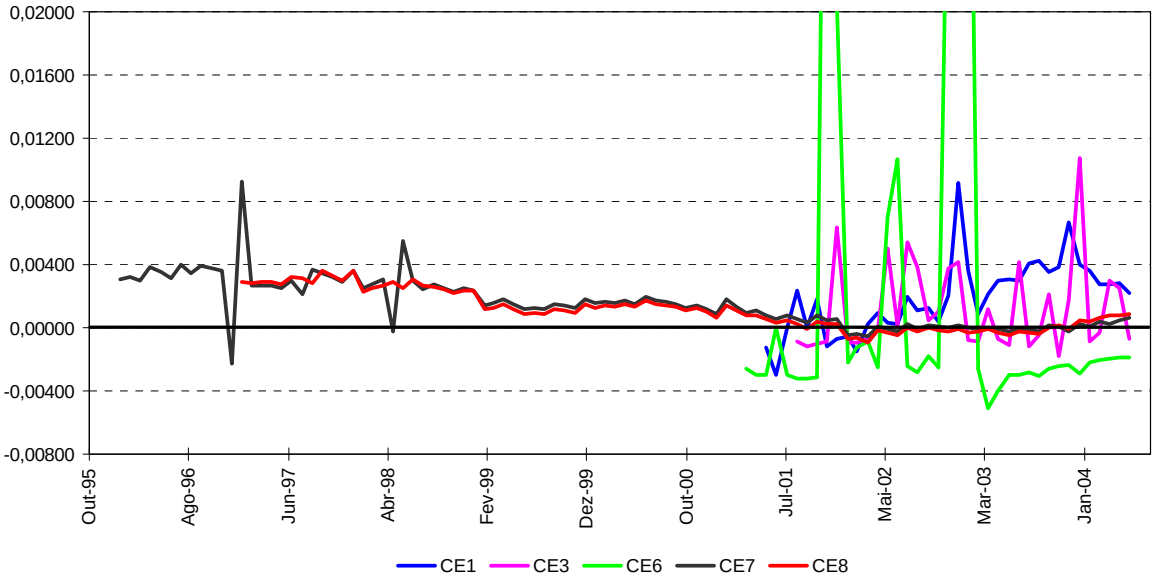


TWELVE MONTH MOVING AVERAGE OF RAW MONTHLY TOTAL RETURNS (CE2, CE4, and CE5)

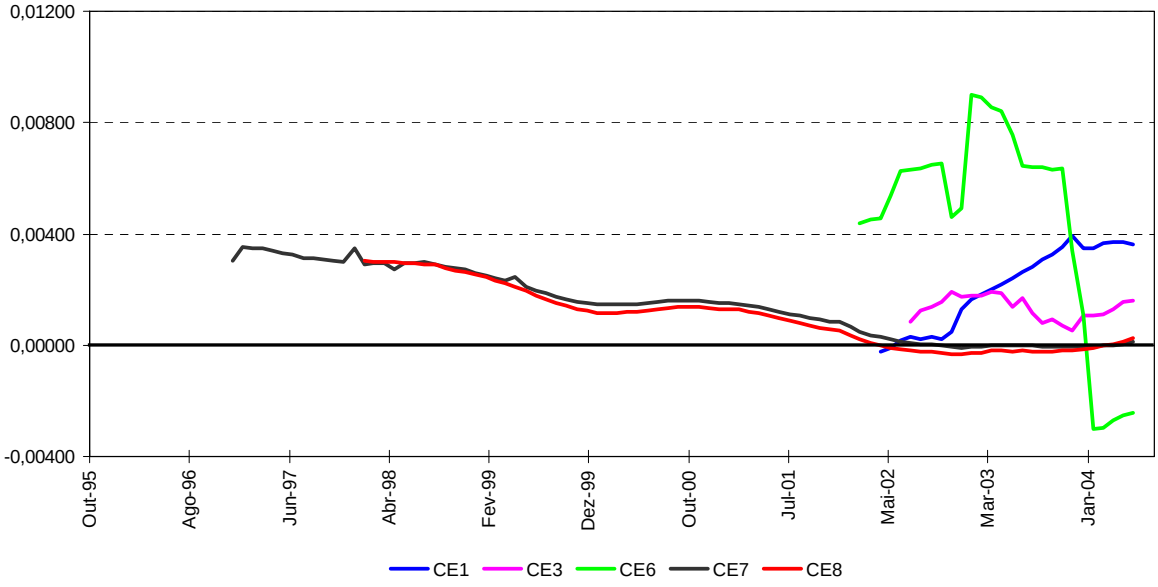


Appendix 5.4 - Scatter Plots for closed ended funds' real returns (continued)

RAW MONTHLY TOTAL RETURNS (CE1, CE3, CE6, CE7, and CE8)



TWELVE MONTH MOVING AVERAGE OF RAW MONTHLY TOTAL RETURNS (CE1,CE3, CE6, CE7, and CE8)



Appendix 5.5 - Autocorrelations of REIFs' nominal returns

The tables below present autocorrelations of open-ended and closed-ended REIF nominal monthly return time series for lags up to 13 months. The tables include autocorrelations (AC) and respective p-values and partial autocorrelations (PAC) for each lag interval considered. Underlined values are significant at the 1% level. Only series with more than 60 data points were included.

OE2- Nominal					OE5- Nominal				
Lag	AC	Box-Ljung	Prob.	PAC	Lag	AC	Box-Ljung	Prob.	PAC
1	**0,918**	103,600	0,000	0,918	1	**0,907**	101,280	0,000	0,907
2	**0,900**	203,993	0,000	0,364	2	**0,891**	199,851	0,000	0,385
3	**0,879**	300,569	0,000	0,142	3	**0,884**	297,652	0,000	0,248
4	**0,832**	387,920	0,000	-0,139	4	**0,822**	382,904	0,000	-0,226
5	**0,817**	472,997	0,000	0,080	5	**0,810**	466,399	0,000	0,053
6	**0,794**	553,878	0,000	0,043	6	**0,780**	544,572	0,000	-0,017
7	**0,748**	626,317	0,000	-0,146	7	**0,727**	613,072	0,000	-0,113
8	**0,719**	693,859	0,000	-0,068	8	**0,693**	675,834	0,000	-0,121
9	**0,705**	759,405	0,000	0,150	9	**0,658**	732,972	0,000	0,015
10	**0,652**	816,037	0,000	-0,154	10	**0,636**	786,731	0,000	0,159
11	**0,651**	872,874	0,000	0,141	11	**0,603**	835,590	0,000	-0,009
12	**0,627**	926,177	0,000	0,023	12	**0,580**	881,227	0,000	0,020
13	**0,582**	972,568	0,000	-0,123	13	**0,555**	923,363	0,000	-0,013

OE8- Nominal					OE9- Nominal				
Lag	AC	Box-Ljung	Prob.	PAC	Lag	AC	Box-Ljung	Prob.	PAC
1	**0,899**	99,380	0,000	0,899	1	**0,56**	38,637	0,000	0,560
2	**0,848**	188,591	0,000	0,209	2	**0,474**	66,526	0,000	0,233
3	**0,795**	267,580	0,000	0,021	3	**0,411**	87,684	0,000	0,118
4	**0,763**	341,109	0,000	0,101	4	**0,319**	100,501	0,000	0,001
5	**0,748**	412,408	0,000	0,132	5	**0,237**	107,642	0,000	-0,035
6	**0,714**	477,947	0,000	-0,046	6	**0,337**	122,227	0,000	0,225
7	**0,689**	539,540	0,000	0,021	7	**0,262**	131,116	0,000	-0,009
8	**0,658**	596,105	0,000	-0,007	8	**0,272**	140,814	0,000	0,060
9	**0,624**	647,475	0,000	-0,040	9	**0,255**	149,388	0,000	0,006
10	**0,605**	696,250	0,000	0,048	10	**0,3**	161,397	0,000	0,126
11	**0,568**	739,587	0,000	-0,073	11	**0,297**	173,236	0,000	0,091
12	**0,540**	779,088	0,000	-0,019	12	**0,356**	190,397	0,000	0,110
13	**0,516**	815,549	0,000	0,032	13	**0,346**	206,738	0,000	0,058

Appendix 5.5 - Autocorrelations of REIFs' nominal returns (continued)

OE10- Nominal				
Lag	AC	Box-Ljung	Prob.	PAC
1	**0,860**	90,954	0,000	0,860
2	**0,851**	180,765	0,000	0,428
3	**0,819**	264,745	0,000	0,154
4	**0,784**	342,310	0,000	0,014
5	**0,735**	411,067	0,000	-0,095
6	**0,699**	473,749	0,000	-0,048
7	**0,692**	535,759	0,000	0,136
8	**0,637**	588,872	0,000	-0,066
9	**0,629**	641,011	0,000	0,059
10	**0,581**	685,978	0,000	-0,089
11	**0,552**	726,916	0,000	-0,056
12	**0,536**	765,909	0,000	0,08
13	**0,466**	795,637	0,000	-0,191

CE2- Nominal				
Lag	AC	Box-Ljung	Prob.	PAC
1	0,073	0,652	0,419	0,073
2	0,018	0,692	0,708	0,013
3	0,004	0,694	0,875	0,002
4	-0,012	0,713	0,950	-0,013
5	-0,021	0,770	0,979	-0,019
6	-0,016	0,803	0,992	-0,013
7	-0,011	0,819	0,997	-0,008
8	-0,015	0,847	0,999	-0,013
9	-0,003	0,848	1,000	-0,001
10	-0,014	0,873	1,000	-0,014
11	0,006	0,878	1,000	0,007
12	0,000	0,878	1,000	-0,002
13	-0,023	0,947	1,000	-0,024

CE4 - Nominal				
Lag	AC	Box-Ljung	Prob.	PAC
1	-0,072	0,608	0,435	-0,072
2	-0,038	0,776	0,678	-0,043
3	-0,079	1,52	0,678	-0,085
4	-0,123	3,368	0,498	-0,14
5	-0,119	5,093	0,405	-0,153
6	-0,047	5,364	0,498	-0,099
7	-0,07	5,967	0,544	-0,135
8	-0,115	7,633	0,47	-0,213
9	0,148	10,423	0,317	0,032
10	-0,105	11,825	0,297	-0,2
11	-0,036	11,991	0,364	-0,185
12	0,247	19,961	0,068	0,139
13	0,229	26,894	0,013	0,233

CE5- Nominal				
Lag	AC	Box-Ljung	Prob.	PAC
1	-0,059	0,427	0,513	-0,059
2	-0,119	2,181	0,336	-0,123
3	-0,119	3,966	0,265	-0,137
4	0,051	4,295	0,368	0,018
5	-0,079	5,081	0,406	-0,109
6	0,064	5,606	0,469	0,044
7	-0,069	6,223	0,514	-0,081
8	0,029	6,333	0,61	0,009
9	-0,118	8,184	0,516	-0,123
10	-0,078	8,984	0,534	-0,128
11	-0,103	10,396	0,495	-0,147
12	**0,567**	53,922	0,000	0,52
13	**-0,052**	54,287	0,000	-0,05

Appendix 5.6 - Autocorrelations of REIFs' real returns

The tables below present autocorrelations of open-ended and closed-ended REIF real monthly return time series for lags up to 13 months. The tables include autocorrelations and respective p-values and partial autocorrelations for each lag interval considered. Underlined values are significant at the 1% level. Only series with more than 60 data points were included.

OE2 - Real

Lag	AC	Box-Ljung	Prob.	PAC
1	**0,919**	103,928	0,000	0,919
2	**0,907**	205,886	0,000	0,398
3	**0,896**	306,436	0,000	0,222
4	**0,848**	397,260	0,000	-0,177
5	**0,834**	485,705	0,000	0,019
6	**0,809**	569,816	0,000	0,006
7	**0,759**	644,398	0,000	-0,170
8	**0,731**	714,264	0,000	-0,075
9	**0,714**	781,451	0,000	0,130
10	**0,659**	839,168	0,000	-0,134
11	**0,654**	896,686	0,000	0,152
12	**0,636**	951,487	0,000	0,099
13	**0,591**	999,338	0,000	-0,086

OE5- Real

Lag	AC	Box-Ljung	Prob.	PAC
1	**0,887**	96,802	0,000	0,887
2	**0,872**	191,081	0,000	0,398
3	**0,865**	284,746	0,000	0,260
4	**0,795**	364,443	0,000	-0,206
5	**0,785**	442,909	0,000	0,054
6	**0,752**	515,531	0,000	-0,018
7	**0,724**	583,405	0,000	0,077
8	**0,685**	644,779	0,000	-0,135
9	**0,643**	699,230	0,000	-0,084
10	**0,624**	751,119	0,000	0,044
11	**0,585**	797,082	0,000	0,023
12	**0,574**	841,687	0,000	0,105
13	**0,554**	883,713	0,000	0,001

OE8- Real

Lag	AC	Box-Ljung	Prob.	PAC
1	**0,833**	85,372	0,000	0,833
2	**0,801**	164,973	0,000	0,350
3	**0,787**	242,407	0,000	0,229
4	**0,765**	316,264	0,000	0,119
5	**0,759**	389,673	0,000	0,128
6	**0,709**	454,309	0,000	-0,074
7	**0,669**	512,293	0,000	-0,084
8	**0,631**	564,406	0,000	-0,085
9	**0,577**	608,366	0,000	-0,137
10	**0,571**	651,796	0,000	0,056
11	**0,504**	685,849	0,000	-0,131
12	**0,484**	717,547	0,000	0,049
13	**0,459**	746,317	0,000	0,044

OE9- Real

Lag	AC	Box-Ljung	Prob.	PAC
1	**0,472**	27,398	0,000	0,472
2	**0,38**	45,307	0,000	0,202
3	**0,32**	58,144	0,000	0,110
4	**0,237**	65,242	0,000	0,015
5	**0,15**	68,110	0,000	-0,042
6	**0,285**	78,552	0,000	0,226
7	**0,205**	84,012	0,000	0,000
8	**0,228**	90,783	0,000	0,072
9	**0,211**	96,658	0,000	0,016
10	**0,278**	106,912	0,000	0,140
11	**0,278**	117,287	0,000	0,113
12	**0,345**	133,461	0,000	0,127
13	**0,340**	149,315	0,000	0,097

Appendix 5.6 - Autocorrelations of REIFs' real returns (continued)

OE10- Real				
Lag	AC	Box-Ljung	Prob.	PAC
1	**0,782**	75,257	0,000	0,782
2	**0,79**	152,715	0,000	0,46
3	**0,775**	227,885	0,000	0,267
4	**0,743**	297,495	0,000	0,096
5	**0,691**	358,306	0,000	-0,067
6	**0,638**	410,551	0,000	-0,142
7	**0,66**	467,033	0,000	0,131
8	**0,583**	511,398	0,000	-0,069
9	**0,584**	556,456	0,000	0,069
10	**0,539**	595,116	0,000	-0,041
11	**0,508**	629,723	0,000	-0,064
12	**0,511**	665,162	0,000	0,092
13	**0,418**	689,015	0,000	-0,185

CE2- Real				
Lag	AC	Box-Ljung	Prob.	PAC
1	0,0730	0,6520	0,4190	0,0730
2	0,0180	0,6920	0,7080	0,0130
3	0,0040	0,6940	0,8750	0,0020
4	-0,0120	0,7130	0,9500	-0,0130
5	-0,0210	0,7700	0,9790	-0,0190
6	-0,0160	0,8030	0,9920	-0,0130
7	-0,0110	0,8190	0,9970	-0,0080
8	-0,0150	0,8470	0,9990	-0,0130
9	-0,0030	0,8480	1,0000	-0,0010
10	-0,0140	0,8730	1,0000	-0,0140
11	0,0060	0,8780	1,0000	0,0070
12	0,0000	0,8780	1,0000	-0,0020
13	-0,0230	0,9470	1,0000	-0,0240

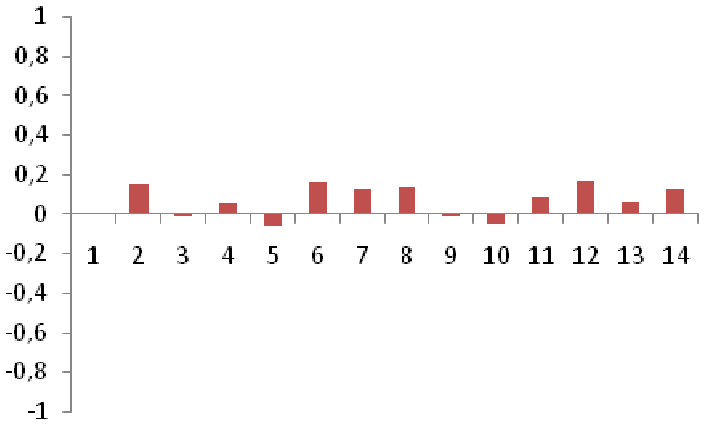
CE5- Real				
Lag	AC	Box-Ljung	Prob.	PAC
1	-0,059	0,427	0,513	-0,059
2	-0,119	2,181	0,336	-0,123
3	-0,119	3,966	0,265	-0,137
4	0,051	4,295	0,368	0,018
5	-0,079	5,081	0,406	-0,109
6	0,064	5,606	0,469	0,044
7	-0,069	6,223	0,514	-0,081
8	0,029	6,333	0,610	0,009
9	-0,118	8,184	0,516	-0,123
10	-0,078	8,984	0,534	-0,128
11	-0,103	10,396	0,495	-0,147
12	**0,567**	53,922	0,000	0,520
13	**-0,052**	54,287	0,000	-0,050

CE4- Real				
Lag	AC	Box-Ljung	Prob.	PAC
1	-0,072	0,608	0,435	-0,072
2	-0,038	0,776	0,678	-0,043
3	-0,079	1,520	0,678	-0,085
4	-0,123	3,368	0,498	-0,140
5	-0,119	5,093	0,405	-0,153
6	-0,047	5,364	0,498	-0,099
7	-0,070	5,967	0,544	-0,135
8	-0,115	7,633	0,470	-0,213
9	0,148	10,423	0,317	0,032
10	-0,105	11,825	0,297	-0,200
11	-0,036	11,991	0,364	-0,185
12	0,247	19,961	0,068	0,139
13	0,229	26,894	0,013	0,233

Appendix 5.7 - Autocorrelations of the PSI 20 Index

The table below presents autocorrelations of the PSI20 stock index (sources: *Banco de Portugal* and *Euronext Lisboa*) return time series for lags up to 13 months considering data from January 2000 to December 2006.

Lag	AC
1	0,150
2	0,000
3	0,057
4	-0,060
5	0,163
6	0,133
7	0,137
8	-0,008
9	-0,053
10	0,086
11	0,171
12	0,064
13	0,127



Appendix 5.8 – Cross correlations of nominal returns – open-ended funds

The tables below present contemporaneous cross-correlations for open-ended REIFs' nominal monthly return time series for the three different reference periods. Underlined values are significant at least the 5% level. In detail, (**) indicates that correlation is significant at the 0.01 level and (*) that correlation is significant at the 0.05 level;

Open-ended Funds - Monthly Nominal Return Correlations – Jun2001 to May 2004

	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
OE2	1	-0,039	**0,568(**)**	**0,536(**)**	0,239	0,295	**0,531(**)**	0,089	**0,349(*)**
OE3	-0,039	1	0,087	-0,056	0,104	-0,049	0,069	0,292	0,238
OE4	**0,568(**)**	0,087	1	**0,639(**)**	0,176	0,282	**0,646(**)**	0,192	**0,562(**)**
OE5	**0,536(**)**	-0,056	**0,639(**)**	1	**0,333(*)**	0,162	**0,681(**)**	0,299	**0,705(**)**
OE6	0,239	0,104	0,176	**0,333(*)**	1	0,082	0,019	**0,394(*)**	0,272
OE7	0,295	-0,049	0,282	0,162	0,082	1	0,071	-0,078	0,080
OE8	**0,531(**)**	0,069	**0,646(**)**	**0,681(**)**	0,019	0,071	1	0,224	**0,529(**)**
OE9	0,089	0,292	0,192	0,299	**0,394(*)**	-0,078	0,224	1	0,165
OE10	**0,349(*)**	0,238	**0,562(**)**	**0,705(**)**	0,272	0,080	**0,529(**)**	0,165	1

Open-ended Funds - Monthly Nominal Return Correlations – Jun1999 to May 2004

	OE2	OE4	OE5	OE8	OE9	OE10
OE2	1	**0,405(**)**	**0,552(**)**	**0,451(**)**	0,098	**0,308(*)**
OE4	**0,405(**)**	1	**0,704(**)**	**0,617(**)**	0,096	0,252
OE5	**0,552(**)**	**0,704(**)**	1	**0,708(**)**	**0,258(*)**	**0,589(**)**
OE8	**0,451(**)**	**0,617(**)**	**0,708(**)**	1	0,155	**0,406(**)**
OE9	0,098	0,096	**0,258(*)**	0,155	1	0,114
OE10	**0,308(*)**	0,252	**0,589(**)**	**0,406(**)**	0,114	1

Open-ended Funds - Monthly Nominal Return Correlations – Jun1994 to May 2004

	OE2	OE5	OE8	OE9	OE10
OE2	1	**0,888(**)**	**0,844(**)**	**0,616(**)**	**0,715(**)**
OE5	**0,888(**)**	1	**0,884(**)**	**0,667(**)**	**0,836(**)**
OE8	**0,844(**)**	**0,884(**)**	1	**0,661(**)**	**0,850(**)**
OE9	**0,616(**)**	**0,667(**)**	**0,661(**)**	1	**0,604(**)**
OE10	**0,715(**)**	**0,836(**)**	**0,850(**)**	**0,604(**)**	1

Appendix 5.9 – Cross correlations of real returns – open-ended funds

The tables below present contemporaneous cross-correlations for open-ended REIFs' real monthly return time series for the three different reference periods. Underlined values are significant at least the 5% level. In detail, (**) indicates that correlation is significant at the 0.01 level and (*) that correlation is significant at the 0.05 level;

Open-ended Funds - Real Return Correlations – Jun2001 to May 2004

	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
OE2	1	0,136	**0,575(**)**	**0,502(**)**	0,131	**0,418(*)**	**0,544(**)**	-0,065	0,132
OE3	0,136	1	**0,354(*)**	0,088	0,103	0,150	**0,373(*)**	0,243	0,300
OE4	**0,575(**)**	**0,354(*)**	1	**0,372(*)**	-0,013	**0,499(**)**	**0,615(**)**	-0,063	0,202
OE5	**0,502(**)**	0,088	**0,372(*)**	1	0,182	0,281	0,301	0,073	**0,405(*)**
OE6	0,131	0,103	-0,013	0,182	1	0,042	-0,227	**0,343(*)**	0,137
OE7	**0,418(*)**	0,150	**0,499(**)**	0,281	0,042	1	**0,330(*)**	-0,152	0,014
OE8	**0,544(**)**	**0,373(*)**	**0,615(**)**	0,301	-0,227	**0,330(*)**	1	-0,066	0,073
OE9	-0,065	0,243	-0,063	0,073	**0,343(*)**	-0,152	-0,066	1	-0,010
OE10	0,132	0,300	0,202	**0,405(*)**	0,137	0,014	0,073	-0,010	1

Open-ended Funds – Real Return Correlations – Jun1999 to May 2004

	OE2	OE4	OE5	OE8	OE9	OE10
OE2	1	**0,784(**)**	**0,818(**)**	**0,800(**)**	0,210	**0,534(**)**
OE4	**0,784(**)**	1	**0,925(**)**	**0,909(**)**	0,240	**0,644(**)**
OE5	**0,818(**)**	**0,925(**)**	1	**0,904(**)**	**0,309(*)**	**0,706(**)**
OE8	**0,800(**)**	**0,909(**)**	**0,904(**)**	1	0,244	**0,583(**)**
OE9	0,210	0,240	**0,309(*)**	0,244	1	0,174
OE10	**0,534(**)**	**0,644(**)**	**0,706(**)**	**0,583(**)**	0,174	1

Open-ended Funds - Real Return Correlations – Jun1994 to May 2004

	OE2	OE5	OE8	OE9	OE10
OE2	1	**0,875(**)**	**0,843(**)**	**0,510(**)**	**0,656(**)**
OE5	**0,875(**)**	1	**0,847(**)**	**0,552(**)**	**0,770(**)**
OE8	**0,843(**)**	**0,847(**)**	1	**0,505(**)**	**0,720(**)**
OE9	**0,510(**)**	**0,552(**)**	**0,505(**)**	1	**0,461(**)**
OE10	**0,656(**)**	**0,770(**)**	**0,720(**)**	**0,461(**)**	1

Appendix 5.10 – Cross correlations of nominal returns – closed-ended funds

The tables below present contemporaneous cross-correlations for closed-ended REIFs' nominal monthly return time series for the three different reference periods. Underlined values are significant at least the 5% level. In detail, (**) indicates that correlation is significant at the 0.01 level and (*) that correlation is significant at the 0.05 level;

Closed Ended Funds - Nominal Return Correlations – Jun2001 to May 2004

	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8
CE1	1	-0,327	0,134	0,143	0,278	0,040	**-0,446(**)**	**-0,362(*)**
CE2	-0,327	1	-0,028	0,276	0,002	-0,012	0,303	**0,477(**)**
CE3	0,134	-0,028	1	0,312	**0,704(**)**	0,093	0,034	0,117
CE4	0,143	0,276	0,312	1	**0,566(**)**	0,179	0,089	0,089
CE5	0,278	0,002	**0,704(**)**	**0,566(**)**	1	0,200	0,134	0,191
CE6	0,040	-0,012	0,093	0,179	0,200	1	0,200	0,095
CE7	**-0,446(**)**	0,303	0,034	0,089	0,134	0,200	1	**0,874(**)**
CE8	**-0,362(*)**	**0,477(**)**	0,117	0,089	0,191	0,095	**0,874(**)**	1

Closed Ended Funds - Nominal Return Correlations – Jun1999 to May 2004

	CE2	CE4	CE5	CE7	CE8
CE2	1	0,214	0,042	0,130	0,168
CE4	0,214	1	**0,493(**)**	0,040	0,027
CE5	0,042	**0,493(**)**	1	0,059	0,094
CE7	0,130	0,040	0,059	1	**0,916(**)**
CE8	0,168	0,027	0,094	**0,916(**)**	1

Closed Ended Funds - Nominal Return Correlations – Jun1994 to May 2004

	CE2	CE4	CE5
CE2	1	0,052	0,053
CE4	0,052	1	**0,436(**)**
CE5	0,053	**0,436(**)**	1

Appendix 5.11 – Cross correlations of real returns – closed-ended funds

The tables below present contemporaneous cross-correlations for closed-ended REIFs' real monthly return time series for the three different reference periods. Underlined values are significant at least the 5% level. In detail, (**) indicates that correlation is significant at the 0.01 level and (*) that correlation is significant at the 0.05 level;

Closed Ended Funds - Real Return Correlations – Jun2001 to May 2004

	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8
CE1	1	-0,049	0,169	0,283	0,279	-0,026	-0,111	0,123
CE2	-0,049	1	0,007	0,275	0,001	-0,026	**0,486(**)**	**0,521(**)**
CE3	0,169	0,007	1	0,301	**0,696(**)**	0,067	0,140	0,231
CE4	0,283	0,275	0,301	1	**0,567(**)**	0,166	0,040	0,040
CE5	0,279	0,001	**0,696(**)**	**0,567(**)**	1	0,191	0,185	0,191
CE6	-0,026	-0,026	0,067	0,166	0,191	1	0,091	-0,056
CE7	-0,111	**0,486(**)**	0,140	0,040	0,185	0,091	1	**0,831(**)**
CE8	0,123	**0,521(**)**	0,231	0,040	0,191	-0,056	**0,831(**)**	1

Closed Ended Funds - Real Return Correlations – Jun1999 to May 2004

	CE2	CE4	CE5	CE7	CE8
CE2	1	0,231	0,059	**0,355(**)**	**0,376(**)**
CE4	0,231	1	**0,496(**)**	0,076	0,071
CE5	0,059	**0,496(**)**	1	0,104	0,125
CE7	**0,355(**)**	0,076	0,104	1	**0,961(**)**
CE8	**0,376(**)**	0,071	0,125	**0,961(**)**	1

Closed Ended Funds - Real Return Correlations – Jun2001 to May 2004

	CE2	CE4	CE5
CE2	1	0,058	0,055
CE4	0,058	1	**0,437(**)**
CE5	0,055	**0,437(**)**	1

Appendix 5.12 – Opened Ended Fund Correlations with exogenous variables – GDP variation, ID variation and PDI

The tables below present contemporaneous and lagged correlations (quarterly, up to one year) for open-ended REIFs' nominal monthly return time series with exogenous variables – gross domestic product (GDP) variation, internal demand (ID) variation and production of the construction industry (PDI);

	Lag	OE1	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
	-4Q	-0,157	0,195	0,280	0,143	-0,023	-0,393	0,156	0,142	**-0,548**	**0,412**
	-3Q	0,293	**-0,457**	0,026	-0,170	0,114	-0,123	-0,077	0,102	-0,165	0,245
	-2Q	0,032	0,046	-0,294	-0,351	0,086	**0,792**	-0,136	-0,288	**0,494**	-0,296
	-1Q	0,079	0,298	**-0,448**	0,006	0,024	0,130	0,140	0,036	0,114	-0,108
PDI	-	-0,157	0,195	0,280	0,143	-0,023	-0,393	0,156	0,142	**-0,548**	**0,412**
	+1Q	**0,491**	0,262	0,258	0,019	0,043	-0,186	0,042	0,153	-0,114	0,116
	+2Q	0,288	-0,035	0,270	-0,195	0,102	0,108	-0,182	0,105	**0,716**	-0,323
	+3Q	-0,084	-0,103	0,300	0,337	-0,064	**0,652**	-0,230	0,077	0,148	-0,041
	+4Q	**-0,495**	-0,171	**-0,576**	0,033	-0,292	-0,729	0,298	-0,110	**-0,690**	-0,037

	Lag	OE1	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
	-4Q	**-0,525**	0,353	-0,287	**0,632**	0,278	0,079	0,295	0,211	0,109	0,054
	-3Q	0,010	0,339	0,171	0,394	0,319	-0,095	**-0,527**	0,251	0,202	0,115
	-2Q	-0,282	0,339	-0,154	**0,536**	0,281	0,196	-0,271	0,206	0,233	0,110
	-1Q	**-0,572**	0,367	0,046	**0,554**	0,254	-0,092	-0,030	0,220	0,156	0,105
GDP	-	**-0,525**	0,353	-0,287	**0,632**	0,278	0,079	0,295	0,211	0,109	0,054
	+1Q	0,297	0,396	**-0,629**	**0,570**	0,334	0,220	-0,063	0,236	0,238	0,022
	+2Q	0,063	**0,409**	0,054	**0,503**	0,308	0,398	0,148	0,193	0,191	0,066
	+3Q	**0,555**	**0,427**	0,040	**0,576**	0,325	0,031	0,205	0,260	-0,017	0,165
	+4Q	0,232	0,348	0,172	**0,533**	0,321	-0,289	0,398	0,253	0,035	0,144

	Lag	OE1	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
	-4Q	**-0,474**	0,317	-0,333	**0,612**	0,230	0,343	0,340	0,140	0,222	0,035
	-3Q	**-0,877**	0,215	-0,079	**0,537**	0,168	-0,208	0,238	0,004	-0,073	-0,058
	-2Q	-0,235	0,198	-0,249	**0,631**	0,078	-0,339	-0,107	0,006	-0,063	-0,051
	-1Q	0,178	0,185	-0,198	**0,523**	0,053	0,308	-0,302	-0,016	0,015	-0,114
ID	-	0,180	**0,408**	-0,047	**0,665**	0,269	**0,680**	0,132	0,215	0,205	0,029
	+1Q	-0,013	0,193	**-0,434**	**0,670**	0,085	-0,107	**0,651**	0,037	-0,034	-0,146
	+2Q	0,276	0,215	0,055	**0,622**	0,120	0,018	0,335	0,027	-0,074	-0,067
	+3Q	**0,507**	0,147	-0,044	**0,648**	0,122	0,226	0,009	-0,007	0,196	-0,114
	+4Q	**0,464**	-0,280	0,069	**0,611**	-0,377	0,027	-0,222	**-0,467**	-0,239	**-0,499**

Appendix 5.13 – Open-ended Fund Nominal Return Correlations with exogenous variables –IPD Indexes

The tables below present contemporaneous and lagged correlations (quarterly, up to one and a half year) for open-ended REIFs' nominal monthly return time series with exogenous variables – IPD Overall Market Index (IPDGEN) and IPD Office Sector Index (IPDOFF);

	Lag	OE1	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
	-6Q	0,0124	0,2013	-0,0049	0,0710	**0,5035**	0,2203	0,1363	0,4362	0,0906	**0,5508**
	-5Q	0,0725	0,2013	-0,0698	0,1135	**0,5138**	0,1834	0,3554	0,3404	-0,1278	**0,5691**
	-4Q	0,1243	0,2496	-0,0049	0,0881	**0,5115**	0,1859	0,3981	0,3609	-0,0782	**0,6016**
	-3Q	0,1794	0,3016	0,0529	0,0710	**0,5076**	0,1932	**0,4490**	0,3822	-0,0526	**0,6225**
	-2Q	0,2269	0,3445	0,1082	0,0547	**0,5035**	0,2076	**0,4899**	**0,4057**	-0,0259	**0,6407**
	-1Q	0,2788	**0,4030**	0,1492	0,0442	**0,5142**	0,2203	0,1177	**0,4281**	0,0025	**0,6410**
IPDGEN	-	0,3292	**0,4492**	0,1734	0,0320	**0,5128**	0,2265	0,1363	**0,4474**	0,0269	**0,6385**
	+1Q	0,3540	**0,4901**	0,1902	0,0397	**0,5149**	0,2369	0,1425	**0,4362**	0,0620	**0,6300**
	+2Q	0,3649	**0,5567**	0,2046	0,0189	**0,4910**	0,2306	0,1423	**0,4395**	0,0906	**0,5967**
	+3Q	0,3601	**0,5840**	0,2145	0,0237	**0,4781**	0,2259	0,1383	**0,4616**	0,1229	**0,5508**
	+4Q	0,3733	**0,5910**	0,1812	-0,0043	**0,4399**	0,2245	0,1303	**0,4510**	0,1610	**0,4944**
	+5Q	0,3738	**0,6150**	0,1599	-0,0176	**0,4241**	0,2197	0,1152	**0,4292**	0,2044	**0,4586**
	+6Q	0,3673	**0,5765**	0,1302	-0,0381	0,3825	0,1946	0,0904	0,3994	0,2499	0,3964

	-6Q	-0,1207	0,0328	-0,2093	**0,5628**	**0,6804**	0,0933	0,1560	0,3742	-0,0875	0,3232
	-5Q	-0,0592	0,1024	-0,1764	**0,5392**	**0,6806**	0,1088	0,1991	**0,4024**	-0,0827	0,3796
	-4Q	-0,0024	-0,0024	-0,0024	-0,0024	-0,0024	-0,0024	-0,0024	-0,0024	-0,0024	-0,0024
	-3Q	0,0476	0,1973	-0,0936	**0,5050**	**0,6887**	0,1403	0,2911	**0,4653**	-0,0529	**0,4879**
	-2Q	0,0877	0,2513	-0,0637	**0,4951**	**0,7027**	0,1579	0,3505	**0,4941**	-0,0295	**0,5415**
	-1Q	0,1257	0,2999	-0,0443	**0,4870**	**0,7228**	0,1762	0,1468	**0,5299**	-0,0096	**0,5765**
IPDOFF	-	0,1624	0,3524	-0,0320	**0,4709**	**0,7371**	0,1923	0,1595	**0,5587**	0,0051	**0,6031**
	+1Q	0,1870	**0,4005**	-0,0214	**0,4775**	**0,7662**	0,2155	0,1688	**0,5891**	0,0379	**0,6289**
	+2Q	0,2037	**0,4568**	-0,0149	**0,4602**	**0,7819**	0,2272	0,1725	**0,6188**	0,0709	**0,6482**
	+3Q	0,2108	**0,5065**	-0,0111	**0,4640**	**0,8000**	0,2384	0,1745	**0,6478**	0,0991	**0,6592**
	+4Q	0,2394	**0,5543**	-0,0032	**0,4425**	**0,8078**	0,2532	0,1760	**0,6623**	0,1303	**0,6755**
	+5Q	0,2691	**0,5969**	-0,0040	**0,4285**	**0,8229**	0,2631	0,1693	**0,6726**	0,1572	**0,6802**
	+6Q	0,2862	**0,6117**	-0,0073	**0,4090**	**0,8208**	0,2472	0,1532	**0,6814**	0,1817	**0,6756**

Appendix 5.14 - Closed-ended Fund Nominal Return Correlations with exogenous variables –IPD Indexes

The tables below present contemporaneous and lagged correlations (quarterly, up to one and a half year) for closed-ended REIFs' nominal monthly return time series with exogenous variables – IPD Overall Market Index (IPDGEN) and IPD Office Sector Index (IPDOFF);

	Lag	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8
	-6Q	**-0,430**	-0,190	0,051	0,084	-0,059	-0,080	**0,761**	**0,718**
	-5Q	**-0,707**	0,027	-0,067	0,013	-0,078	0,004	**0,602**	**0,557**
	-4Q	**-0,706**	-0,013	-0,026	0,007	-0,071	0,047	**0,571**	**0,503**
	-3Q	**-0,695**	-0,050	0,012	-0,003	-0,070	0,088	**0,533**	**0,439**
	-2Q	**-0,680**	-0,096	0,025	-0,011	-0,067	0,129	**0,494**	0,372
	-1Q	**-0,661**	-0,122	0,041	0,050	-0,035	0,171	**0,468**	0,317
IPDGEN	-	**-0,625**	-0,150	0,069	0,047	-0,012	0,210	**0,426**	0,246
	+1Q	**-0,591**	-0,132	0,086	0,037	-0,002	0,237	0,378	0,179
	+2Q	**-0,547**	-0,153	0,086	0,027	0,009	0,267	0,320	0,100
	+3Q	**-0,495**	-0,130	0,076	0,018	0,020	0,299	0,257	0,019
	+4Q	**-0,430**	-0,179	0,073	0,002	0,042	0,334	0,183	-0,076
	+5Q	**-0,353**	-0,190	0,064	-0,020	0,047	0,372	0,122	-0,154
	+6Q	**-0,255**	-0,244	0,051	-0,031	0,049	0,381	0,044	-0,245

	-6Q	**-0,618**	0,263	-0,137	0,084	-0,036	-0,155	**0,710**	**0,718**
	-5Q	**-0,642**	0,235	-0,052	0,060	-0,059	-0,130	**0,735**	**0,729**
	-4Q	**-0,002**	-0,002	-0,002	-0,002	-0,002	-0,002	-0,002	-0,002
	-3Q	**-0,684**	0,202	-0,027	0,061	-0,048	-0,035	**0,761**	**0,727**
	-2Q	**-0,702**	0,177	-0,013	0,062	-0,041	0,007	**0,763**	**0,718**
	-1Q	**-0,715**	0,164	-0,007	0,058	-0,036	0,048	**0,766**	**0,697**
IPDOFF	-	**-0,718**	0,148	-0,007	0,058	-0,034	0,087	**0,759**	**0,666**
	+1Q	**-0,715**	0,138	0,003	0,059	-0,024	0,121	**0,748**	**0,627**
	+2Q	**-0,699**	0,1164	0,0020	0,0623	-0,0148	0,1555	**0,7280**	**0,5777**
	+3Q	**-0,684**	0,1260	-0,0018	0,0646	-0,0121	0,1901	**0,6988**	**0,5176**
	+4Q	**-0,657**	0,0843	0,0013	0,0503	-0,0119	0,2257	**0,6663**	**0,4546**
	+5Q	**-0,630**	0,0385	-0,0006	0,0345	-0,0089	0,2629	**0,6255**	0,3834
	+6Q	**-0,588**	-0,0106	0,0000	0,0137	-0,0065	0,2763	**0,5706**	0,3010

Appendix 5.15 - Open-ended Fund Real Return Correlations with exogenous variables –IPD Indexes

The tables below present contemporaneous and lagged correlations (quarterly, up to one year) for open-ended REIFs' real monthly return time series with exogenous variables – IPD Overall Market Index (IPDGEN) and IPD Office Sector Index (IPDOFF);

	Lag	OE1	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
	-4Q	**-0,505**	**-0,496**	-0,231	**0,456**	**0,570**	0,162	**0,412**	**0,452**	0,024	0,251
	-3Q	-0,221	-0,282	-0,269	0,310	**0,695**	0,328	**0,471**	0,369	-0,131	**0,534**
	-2Q	0,036	0,159	-0,174	0,197	**0,629**	0,357	**0,481**	0,387	-0,148	**0,705**
	-1Q	0,320	0,398	-0,031	0,107	**0,596**	0,311	**0,609**	**0,452**	-0,074	**0,794**
IPDGEN	-	**0,566**	**0,633**	0,152	0,098	**0,596**	0,355	0,249	**0,503**	0,050	**0,777**
	+1Q	**0,614**	**0,780**	0,229	0,070	**0,560**	0,339	0,236	**0,536**	0,174	**0,643**
	+2Q	**0,584**	**0,697**	0,131	0,085	**0,470**	0,245	0,139	**0,591**	0,294	**0,437**
	+3Q	**0,508**	**0,502**	-0,038	-0,063	0,278	0,086	-0,122	**0,458**	0,366	0,187
	+4Q	0,376	0,266	0,203	-0,279	-0,047	-0,099	-0,347	0,156	0,320	-0,066

	-4Q	**-0,761**	-0,195	-0,329	**0,856**	**0,695**	0,012	**0,417**	**0,521**	0,132	-0,173
	-3Q	**-0,552**	-0,213	-0,346	**0,743**	**0,799**	0,141	0,338	**0,483**	-0,026	0,132
	-2Q	-0,146	0,055	-0,238	**0,643**	**0,784**	0,212	0,278	**0,467**	-0,118	**0,417**
	-1Q	0,136	0,252	-0,130	**0,574**	**0,756**	0,268	**0,423**	**0,542**	-0,060	**0,639**
IPDOFF	-	0,328	**0,452**	-0,043	**0,546**	**0,798**	0,341	0,314	**0,629**	0,031	**0,733**
	+1Q	**0,402**	**0,647**	-0,016	**0,522**	**0,867**	**0,400**	0,328	**0,721**	0,121	**0,797**
	+2Q	**0,471**	**0,750**	-0,023	**0,550**	**0,891**	0,365	0,269	**0,823**	0,233	**0,798**
	+3Q	**0,542**	**0,768**	0,038	**0,463**	**0,844**	0,296	0,090	**0,838**	0,310	**0,757**
	+4Q	**0,634**	**0,770**	0,190	0,374	**0,735**	0,211	-0,059	**0,797**	0,360	**0,680**

Appendix 5.16 - Closed-ended Fund Real Return Correlations with exogenous variables –IPD Indexes

The tables below present contemporaneous and lagged correlations (quarterly, up to one year) for closed-ended REIFs' real monthly return time series with exogenous variables – IPD Overall Market Index (IPDGEN) and IPD Office Sector Index (IPDOFF);

	Lag	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8
	-4Q	**-0,690**	**0,436**	**-0,528**	0,090	-0,095	-0,269	**0,707**	**0,756**
	-3Q	**-0,807**	0,315	-0,255	0,115	-0,121	-0,130	**0,814**	**0,839**
	-2Q	**-0,900**	0,131	0,094	0,105	-0,058	-0,030	**0,747**	**0,726**
	-1Q	**-0,919**	-0,066	0,171	0,092	-0,117	0,142	**0,627**	**0,523**
IPDGEN	-	**-0,828**	-0,154	0,255	0,068	-0,051	0,343	**0,487**	0,282
	+1Q	**-0,681**	-0,142	0,193	0,013	0,030	**0,506**	0,288	0,010
	+2Q	-0,384	-0,388	0,065	-0,071	0,037	**0,595**	0,042	-0,296
	+3Q	0,008	**-0,642**	-0,007	-0,180	0,013	**0,484**	-0,242	**-0,591**
	+4Q	**0,472**	**-0,707**	0,002	-0,004	0,037	0,266	**-0,508**	**-0,800**

	-4Q	-0,353	**0,549**	**-0,884**	0,043	-0,029	-0,271	**0,549**	**0,590**
	-3Q	**-0,593**	**0,494**	**-0,510**	0,083	-0,060	-0,287	**0,709**	**0,742**
	-2Q	**-0,762**	**0,427**	-0,114	0,137	-0,054	-0,236	**0,808**	**0,827**
	-1Q	**-0,887**	0,354	0,123	0,092	-0,107	-0,051	**0,855**	**0,833**
IPDOFF	-	**-0,925**	0,252	0,134	0,098	-0,080	0,154	**0,836**	**0,752**
	+1Q	**-0,893**	0,233	0,080	0,105	-0,066	0,330	**0,764**	**0,578**
	+2Q	**-0,771**	0,020	0,047	0,041	-0,047	0,433	**0,611**	0,323
	+3Q	**-0,586**	-0,218	0,082	-0,009	-0,045	0,454	**0,413**	0,050
	+4Q	-0,362	**-0,489**	0,149	-0,033	-0,031	0,453	0,213	-0,203

Appendix 5.17 - Persistency tests at the individual fund level - Open-ended Funds within the Overall Sample

This table present contingency tables and persistency tests for individual open-ended funds and restricted to the Jun 1994 to May 2004 period, considering monthly, quarterly, half-yearly and yearly evaluation periods, were the monthly returns are compounded to produce returns at quarterly, half-yearly and yearly intervals. Funds are classified against the median return of the overall sample. Only repeat winners (Hot Hands) and repeat losers tests are computed and p-values of the test statistics are determined. Statistics in bold marked *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively .

Unit Period		OE1	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
1 month	LL	0	29	22	28	93	16	1	11	16	16
	LW	3	22	6	12	9	8	4	17	9	9
	WL	2	22	5	12	9	8	4	16	10	8
	WW	27	46	16	32	8	6	31	75	84	86
	HOT HANDS	***	***	**	***	-	-	***	***	***	***
	COLD HANDS	-	-	***	**	***	-	-	-	-	-
3 months	LL	0	18	3	11	33	7	0	7	2	6
	LW	0	5	4	5	3	2	1	2	7	3
	WL	0	5	4	5	3	2	1	3	6	4
	WW	10	11	4	6	0	1	10	27	24	26
	HOT HANDS	***	-	-	-	-	-	***	***	***	***
	COLD HANDS	-	***	-	-	***	*	-	*	-	-
6 month	LL	0	9	1	7	17	4	0	3	0	1
	LW	0	3	3	2	1	1	0	1	4	3
	WL	1	3	3	2	1	1	1	2	3	4
	WW	4	4	0	2	0	0	5	13	12	11
	HOT HANDS	-	-	-	-	-	-	-	***	**	*
	COLD HANDS	-	*	-	*	***	-	-	-	-	-
12 month	LL	0	4	3	3	9	1	0	2	0	0
	LW	0	2	0	2	0	1	1	0	0	2
	WL	1	2	0	1	0	1	2	1	0	2
	WW	1	1	0	0	0	0	0	6	9	5
	HOT HANDS	-	-	-	-	-	-	-	*	***	-
	COLD HANDS	-	-	*	-	***	-	-	-	-	-

Appendix 5.18 - Persistency tests at the fund level - Closed-ended Funds in the Overall Sample

This table present contingency tables and persistency tests for individual closed-ended funds and restricted to the Jun 1994 to May 2004 period, considering monthly, quarterly, half-yearly and yearly evaluation periods were the monthly returns are compounded to produce returns at quarterly, half-yearly and yearly intervals. Funds are classified against the median return of the overall sample. Only repeat winners (Hot Hands) and repeat losers tests are computed and p-values of the test statistics are determined. Statistics in bold marked *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Unit Period		CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8
1 month	LL	6	59	10	38	58	28	78	78
	LW	5	20	9	13	22	3	8	5
	WL	4	20	9	12	22	3	8	5
	WW	21	20	5	51	17	4	6	0
	HOT HANDS	***	-	-	***	-	-	-	-
	COLD HANDS	-	***	-	***	***	***	***	***
3 months	LL	4	19	1	8	7	5	30	24
	LW	0	6	1	6	11	1	1	2
	WL	1	6	2	7	11	1	1	2
	WW	6	8	6	16	10	5	0	0
	HOT HANDS	*	-	-	*	-	-	-	-
	COLD HANDS	**	***	-	-	-	-	***	***
6 month	LL	2	8	0	2	1	1	14	14
	LW	0	4	1	2	5	1	1	0
	WL	1	4	2	3	5	1	1	0
	WW	2	3	2	11	8	3	0	0
	HOT HANDS	-	-	-	**	-	-	-	-
	COLD HANDS	-	-	-	-	-	-	***	***
12 month	LL	0	2	0	1	1	0	8	7
	LW	0	3	0	0	1	1	0	0
	WL	1	2	1	1	1	1	0	0
	WW	1	2	1	7	6	1	0	0
	HOT HANDS	-	-	-	**	*	-	-	-
	COLD HANDS	-	-	-	-	-	-	***	***

Appendix 5.19 - Persistency tests at the fund level - Open-ended Funds within the Open-ended Funds Sample

This table present contingency tables and persistency tests for individual open-ended funds and restricted to the Jun 1994 to May 2004 period, considering monthly, quarterly, half-yearly and yearly evaluation periods were the monthly returns are compounded to produce returns at quarterly, half-yearly and yearly intervals. Funds are classified against the median return of the open-ended funds sample. Only repeat winners (Hot Hands) and repeat losers tests are computed and p-values of the test statistics are determined. Statistics in bold marked *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Unit Period		OE1	OE2	OE3	OE4	OE5	OE6	OE7	OE8	OE9	OE10
1 month	LL	0	63	29	48	115	25	5	31	20	22
	LW	3	13	7	12	2	6	7	16	10	10
	WL	2	13	6	12	2	6	7	15	11	10
	WW	27	30	7	12	0	1	21	57	78	77
	HOT HANDS	***	***	-	-	-	-	***	***	***	***
	COLD HANDS	-	-	***	***	***	***	-	-	*	**
3 months	LL	0	24	7	17	37	8	0	13	3	8
	LW	0	3	4	3	1	2	3	1	6	3
	WL	0	4	4	3	1	2	3	2	5	3
	WW	10	8	0	4	0	0	6	23	25	25
	HOT HANDS	***	-	-	-	-	-	-	***	***	***
	COLD HANDS	-	-	-	-	***	*	-	-	-	-
6 month	LL	0	11	2	7	19	4	0	5	0	4
	LW	0	2	2	2	0	1	1	1	4	2
	WL	1	2	3	2	0	1	2	2	3	2
	WW	4	4	0	2	0	0	3	11	12	11
	HOT HANDS	-	-	-	-	-	-	-	**	**	**
	COLD HANDS	-	-	-	-	***	-	-	-	-	-
12 month	LL	0	6	3	3	9	1	0	2	0	2
	LW	0	1	0	1	0	1	0	0	0	1
	WL	1	1	0	1	0	1	1	1	0	1
	WW	1	1	0	1	0	0	2	6	9	5
	HOT HANDS	-	-	-	-	-	-	-	*	***	-
	COLD HANDS	-	-	*	-	-	-	-	-	-	-

Appendix 5.20 - Persistency tests at the fund level - Closed Ended Funds within the Closed-Ended Funds Sample

This table present contingency tables and persistency tests for individual closed-ended funds and restricted to the Jun 1994 to May 2004 period, considering monthly, quarterly, half-yearly and yearly evaluation periods were the monthly returns are compounded to produce returns at quarterly, half-yearly and yearly intervals. Funds are classified against the median return of the closed ended funds sample. Only repeat winners (Hot Hands) and repeat losers tests are computed and p-values of the test statistics are determined. Statistics in bold marked *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Unit Period		CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8
1 month	LL	3	58	7	32	55	28	25	42
	LW	4	21	7	16	22	3	21	13
	WL	3	21	7	15	21	3	21	13
	WW	26	19	12	51	21	4	33	20
	HOT HANDS	***	-	-	***	-	-	-	-
	COLD HANDS	-	***	-	**	***	***	-	***
3 months	LL	2	16	0	8	9	5	16	20
	LW	0	8	1	8	10	1	7	3
	WL	1	8	2	8	11	1	6	2
	WW	8	7	7	13	9	5	3	3
	HOT HANDS	**	-	*	-	-	-	-	-
	COLD HANDS	-	-	-	-	-	-	*	***
6 month	LL	1	5	0	2	2	1	10	12
	LW	0	5	2	3	5	1	3	1
	WL	1	5	2	4	6	1	3	1
	WW	3	4	1	9	6	3	0	0
	HOT HANDS	-	-	-	-	-	-	-	-
	COLD HANDS	-	-	-	-	-	-	*	***
12 month	LL	0	2	1	2	0	0	8	5
	LW	0	2	0	1	1	1	0	1
	WL	1	1	1	2	2	1	0	1
	WW	1	4	0	4	6	1	0	0
	HOT HANDS	-	-	-	-	-	-	-	-
	COLD HANDS	-	-	-	-	-	-	***	-

CHAPTER 6 - REAL ESTATE PORTFOLIO MANAGEMENT IN THE PORTUGUESE MARKET

6.1 INTRODUCTION

Much of the reality regarding the performance of real estate investment that was characterized and analyzed in the previous chapter is inextricably connected to the actual status of professional practice of investment property managers, namely the type and sophistication level of the decision support techniques used.

Despite the multiple dimensions of this complex reality and the consequent difficulties in providing a complete and detailed picture of its true nature in a single initiative, research was developed in order to attain a deeper knowledge of those aspects of professional practice that are closely related to performance measurement, prediction and attribution.

In any kind of investment that requires proactive management there is an obvious relationship between management skills and the performance results, in an ex-ante perspective. In this way, despite the fact that in both direct and indirect real estate investment, as suggested by previous evidence, management may also have an ex-post influence on performance figures, institutional investors are expected to select property portfolio managers according to their proven track record and specific skills. Moreover, knowledge of the reality of managerial behaviour and professional practices is an important aspect for the assessment of the maturity level of a real estate market (Lee, 2005) – the more mature the market is, the more demanding and sophisticated it is in general. Hence, this is a key subject for investors, researchers and the professionals themselves. It is also a major factor to take into account when planning future research directions, thus setting more applied and useful objectives rather than establishing as priority to follow elaborate and sophisticated finance theoretical models which are sometimes considered to have little interest for practical application.

6.2 OBJECTIVE AND METHODOLOGY

The objective of this study was the characterization of current practice and decision-making processes used by organizations and professionals managing real estate as a financial asset, with emphasis on large portfolios. As previously referred to in Chapter 3, the body of knowledge of managerial behaviour in mature markets is developed essentially through survey based studies among institutional investors. Accordingly, the methodology for attaining the aims set has been established on the basis of previous research, as follows:

1. Establishing the main characteristics of the market under study taking into account recent history and economic background ;
2. Defining the approach for the survey, in view of the size of the target population and its structure;
3. Setting specific objectives;
4. Structuring the enquiry layout in order to attain the objectives set;
5. Testing the layout on sample interviews regarding possible revision and improvement;
6. Surveying the population according to the defined procedure;
7. Treating collected data – aggregation of results, descriptive and other statistical procedures to be defined in view of the quality of data;
8. Analyzing results, benchmarking and conclusions.

The first stage, market study, has been exhaustively covered in Chapter 2, being the most significant fact to retain the existence of a rather small population of Portuguese institutions that have a significant present activity and history in managing large diversified property portfolios on a buy-and-hold perspective, being the number of its members estimated between twenty and thirty, depending on the criteria used.

Regarding the factual approach of the subjects, surveying such a small target population precludes traditional mailing proceedings, like the ones used by Farragher *et al.* (1996) (to the universe of the largest property investors of the United States) or Worzala *et al.*, (1997) (to the universe of the US pension funds) for not being usable here. In fact, for such a reduced population, the sample tends to equal the population in number. Mailing enquiries is therefore not adequate – expected reply rates are generally referred at circa 30% of the population (De Witt, 1996), which would not be acceptable for this particular case.

In fact, Farragher *et al.* (1996) suggest that even if there was a greater reply percentage, two other factors could compromise the credibility of the study – the respondents being biased or non-informed. Response bias occurs because companies with more sophisticated practices can be more willing to respond than those with less sophisticated ones. Regarding non-informed respondents, the practical uncertainty on the level of responsibility of the actual respondent(s) within their organization, can compromise the acceptance of collected data. These authors suggest simple tests for bias and non-informed respondents, only proving to be adequate in the context of a larger population. Given the small number of the population in the present case, any individual response is of the utmost importance, so such procedures are not suitable.

In view of the above, the most adequate surveying approach in this case is through individual semi-structured interviews to the chief real estate investment officer of each organization, or someone designated for this purpose (given the usual time contingencies of these professionals and the need for completing the survey in a reasonable time period). This is in line with De Witt (1996) in a similar work developed in the scope of the Netherlands pension funds.

Independently of the enquiry procedure, this survey has to be based on the hypothesis that in any property management organization, all professionals follow the same standards of practice, dictated by the chief real estate investment officer or its equivalent. This means that each chosen individual has to be a significant surrogate of the institutional reality. Accordingly, the population under study is formed by the institutions rather than the professionals, although the survey has to be put to the latter. This hypothesis is rather plausible if one takes into account the rather small number of people employed by most of those institutions (especially at the direction level), their functional nature and their structure. Moreover, any of these organizations must have, to some reasonable extent, common internal standards, proceedings and control, in order to be able to report performance consistently. The same kind of criteria is reported by authors of similar works, like Farragher *et al.* (1996) and Worzala *et al*. (1997), among others.

The chosen methodology of personal interviews will bring obvious added benefits although it may reveal some difficulties (De Witt, 1996). Indeed, a high response rate and a precise identification of the respondent's level in the organization are expected from face-to-face interviews, thus eliminating both low response rates and potential information bias. Adding to the above, personal interviews allow for question rephrasing or adjustment when the interviewee shows confusion of subject matter, as opposed to mail questionnaires that may potentiate the misunderstanding of question scope and/or objectives or the structuring of responses in view of the entire questionnaire instead of a specific point by point response. However, question adjustment in semi-structured interviews may result in possible steering by the interviewer. Hence such procedures should be cautiously used.

The present study builds on the surveys of Farragher *et al.* (1996), De Witt (1996) and Worzala *et al.* (1997), although in different terms and with an enlarged scope. As the first work of its kind (to the author's knowledge) on this market, this study is more explorative by nature, allowing respondents to give multiple or personal original developed answers. This has the advantage of retaining more information on the subject, sometimes beyond the question itself though pertinent, thus opening the way to new more specific developments of this line of research. However, they bear the disadvantage of rendering some imprecise or tentative conclusions based on apparent similarity of individual responses.

6.3 INQUIRY OBJECTIVES, STRUCTURE AND LAYOUT

Reporting on the quality and sophistication of property investment managers' decision-making processes can cover many issues. Given the necessarily limited available time of the respondents, priorities must be elected. In this study, the questionnaires were divided into four different sections, each covering an item related to property management practices. The four subjects included were elected for their relevance and relationship to the work developed and presented in the previous chapters.

The first two sections regard fundamental themes in the property investment universe: the use of information on the property market and the use of appraisals. These issues, undoubtedly central to any activity that develops itself around property, due to the privately trading nature of the market, are in fact largely interconnected: appraisals are largely based in information provided by reference databases (e.g. transaction prices, rent prices, vacancy rates, among others) and these in turn are in many cases built on information provided by appraisers (mainly direct investment performance indices). This theme is partially covered in IPD/Imométrica (2005) regarding appraisal

procedures and evaluation of appraisal quality but the present study develops in different directions, namely the use and the importance of the appraisal.

The last two sections cover the two main vectors of any performance attribution model: asset allocation and property selection, aiming at providing a clearer picture of what analysis procedures and techniques are used to support the decisions that are taken regarding portfolio diversification and investment selection. These are in line with the research of Louargand (1992), De Witt (1996) and Farragher *et al.* (1996).

The use of information is a key issue in any management activity. In Portugal, multi-portfolio property databanks built in a consistent way are rather recent, thus probably yet of relatively limited systematic use by market players. Nevertheless, facts like the entry in the market of multinational property advisor companies, the start of activity of the *Investment Property Databank* (IPD) in Portugal (six years ago), and the creation of several credible direct and indirect property related indexes, create good perspectives for future development, both for demand and supply of quality information, reflecting a need for a more challenging practice based on quality information. For all the above, knowing how national property portfolio managers presently regard, gather and process the available market information is certainly of great interest and was the first objective set for the survey.

Appraisal is of paramount importance to the real estate market and especially to portfolio managers. Under the impossibility of a continuous public transaction price settlement, as in the securities market, property value must be set through appraisal. Value is in the origin of any performance measure and is of vital consideration in major asset or portfolio management decisions, like acquisitions, disposals, renewals, rentals and many others. Rules for the appraisal of real estate fund assets are defined by the market's regulating institution, the CMVM – regarding periodicity, qualification of

appraisers, standards for appraisal and other. However the appraiser's role in determining accounting value of property asset, the quality of appraisals, their periodicity and other related issues are not consensual and have only really been at the centre of the community's interest in recent years. The objective here is to characterize the view of the national real estate portfolio managers on appraisal and appraisers and the current practice of their institutions regarding this subject.

Optimal diversification across different market segments aims at reducing or eliminating risk effects of each specific property and to attain an ideal risk/return relation for a given portfolio. As previously presented in Chapter 3, in both the mixed asset and the property portfolio contexts, asset allocation can either be supported by general experience, based in sophisticated methods or even a combination of both. The first results in purely intuitive diversification, while the second uses historical results to analyze the characteristics of the portfolio and its components, thus justifying the reasons behind past performance and providing support for future investment decisions. The widespread use of the modern financial techniques such as the MPT to the scope of real property is common in leading markets like the UK and the US, supported by a large amount of scientific evidence that asset pricing and market models based on the mean and the variance as measures of return and risks have proven advantages even if not fully adapted in theory to the behaviour of real estate as an asset class. For this, one of the main objectives of this survey was to determine the level of sophistication of techniques used by target organizations when supporting a diversification decision, following on previously cited research (developed for other markets).

Property Selection is the practical execution of the strategic directives of asset allocation. Through the actual selection of held properties (decisions on disposals, acquisitions and maintenance of properties), the management determines a choice for a

set of specific investments, where each may perform either at the same level as their own segment, or may under or over perform it, either through capital appreciation or operations revenue. Hence, another of the main objectives of this survey was to develop effective knowledge on investment analysis and selection techniques actually used by the market players, namely regarding return and risk forecasts that are made for each asset prior to acquisition, quantitative risk assessment tools currently used, decision variables elected for analysis prior to acquisition and types of decision criteria settled for return and risk variables, as well as corresponding benchmarking procedures.

As a complementary transversal objective, the knowledge of the reflexive opinion and perspectives of Portuguese property management institutions was settled in order to reveal more about the reasons for their actual procedures and the framework for decision making. Professionals and institutions must develop some degree of self-awareness, in order to be able to evaluate their position regarding the current standards of practice, the general market environment and the state-of-the-art, thus providing them with material to establish evolution and develop roadmaps.

Naturally, as a preface to the survey, relevant data on the institution is required, including the asset volume under management and the number of people involved in asset allocation analysis and decisions, which allowed a contextual classification and analysis of results.

The main structure of the enquiry is detailed in Table 6-1, and justified against the specific objectives defined. The layout presented is the final version after revision. This has been achieved after a testing procedure, involving two sample interviews to selected population members under study, that naturally were not included in the final aggregate results . The main aspect improved from earlier drafts was the overall length, in order to reduce the duration of interviews, and the objectivity of questions.

Table 6-1 - Survey Specific Objectives and Enquiry Layout

	OBJECTIVES	ENQUIRIES ON
Information	To find how real estate portfolio managers consider, gather and process information.	• Sources of data; • Type of data used or considered relevant; • Use of external databases of relevant historical data for supporting management decisions; • Opinion on the availability of information on return and risk measures of property assets; • Willingness for making own data available – terms and conditions.
Appraisal	To characterize the view on appraisal and appraisers and the current practice of appraisal management.	• Opinion on eventual influence on the appraiser from his institutional client. If existent, identification of most common causes and effects; • Time period between appraisals and number of independent appraisals per period – current practice, opinion on ideal procedure and future perspectives of evolution; • Conditions for qualifying as appraiser for their institution – former experience, certification, academic degrees or specific formation, following of valuation standards, among others; • Method used for establishing value of property (for portfolio valuation, return measurement and other purposes) taking as input the result of the appraisals made in the period.
Asset Allocation	To determine the level of sophistication in techniques used as support of strategic allocation decisions	• Variables considered to segment the market when deciding on portfolio diversification: type of property, localization, age, size, or others; • Methods/Models used for supporting the decision making process of asset allocation: personal experience, simple correlation of segment returns, market models (betas); portfolio optimization using MPT, efficient frontier determination using *Fama's* MAD as a proxy for risk, among others.
Property Selection	To determine the level of sophistication in techniques used for supporting investment decisions	• If and how return and risk forecasts are made for each asset prior to acquisition. • Quantitative risk assessment tools currently used; • Decision variables elected for analysis prior to acquisition; • Types of decision criteria settled for return and risk variables;
Opinion on the Organization's Current Practice	To evaluate self-awareness and perspectives	• Evaluation of current institutional practice on covered issues; • Improvement Potential

6.4 RESULTS

A total of 20 institutions were contacted via traditional mail and also by e-mail for this survey. Two basic election criteria were appointed: first, a global asset volume under management above 50 million Euros and second more than 5 years of market activity. Three main categories of institutions were addressed: REIF management societies; pension funds management societies and private equity property investment companies.

Interviews were held in the period of October 2006 to April 2007 in a total of 11 institutions, representing a total volume of direct or indirect property assets under management above 9300 million Euros[50] and segmented as indicated in Table 6-2.

Table 6-2 – Segmentation of Institutions Included in the Sample Surveyed

This table presents the segmentation of the whole sample of institutions with completed interviews. Data refers to January 2007 and sources include official institutional reports, the CMVM and ISP.

	Number	% of sample's consolidated volume of property assets under management
REIF Management Societies	8	52,93%
Private Equity Property Investment Companies	2	45,14%
Pension Fund Management Societies	1	1,93%
Total	11	100,00%

The large majority of interviewees (more than 90%) were chief property investment officers in the organizations addressed and graduate/senior investment officers in all remaining situations.

[50] According to the data provided by IPD (2007b) on the total asset volume within the institutional investment market, the sample of this survey would represent more than 60% of it.

6.4.1 Information

The importance of information collection for institutional property market players was found to be considerable. Results on Table 6-3 show there seems to be a factual proactive attitude of information collection across the industry[51]. In terms of the systematization of collection processes, storage and usage there was a general perception of large differences existing between players, according to type of institution, group insertion and size, as expected. For instance, larger organizations with larger portfolios tend to show the use of wider range of data sources, both internal and external, and also a greater capacity of handling information in a systematic way. In any case, two overall tendencies were perceivable in the interviews: first that many external data sources, namely large property consultants, were not considered as fully reliable in the information provided, mostly due to conflicts of interest that emerged out of their main activity as brokers; the second was that due to the small size of the national commercial property market, many institutions gather a substantial quantity of information within the everyday operation, especially regarding the structure of supply and demand in leases and transactions, and handle it easily within a small team without much need of sophisticated information treatment, aggregation or storage tools. For larger institutions with cross-border investments, procedures naturally tend to be different.

Table 6-4 shows a relative consensus on the most important data issues that are sought for and utilized for market analysis, benchmarking and other purposes. In any case,

[51] To test the significance of the proportion (p) of the number of positive answers to the total number of responses, a binomial test for $p>1/2$ was performed.

other specialized indices and parameters were circumstantially referred to as also relevant, mostly related to specific types of operations, namely retail.

Table 6-3 – Systematic Collection of Information Databases to Support Property Portfolio Management Activity.

This table presents the answer to the question "Does your organization collect or purchase information databases in a systematic way, in order to support property portfolio management activity?". Only objective answers were acknowledged. To test the significance of the proportion (p) of the number of positive answers to the total number of responses, a binomial test for p>1/2 was performed.

	Yes	*No*	*Yes (%)*	*No (%)*	*Ztest*	*p-value*
All respondents	8	1	88,89%	11,11%	2,333	**0,020**
REIFs	7	1	87,50%	12,50%	2,121	**0,034**

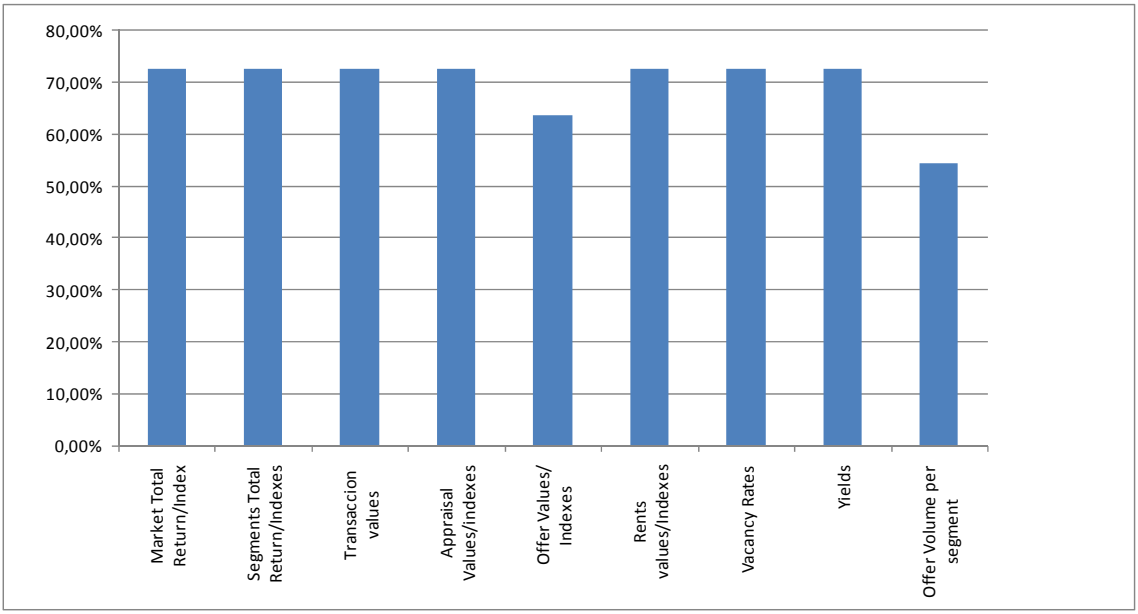
Regarding the sources of information used, Table 6-5 reveals that there is a generalized use of all types of sources, with none outstanding in the overall picture. However, circumstantially, some type of data source may not be regarded as an adequate information provider for different reasons in each case. For some large organizations, the in-house collected information is the most significant part of the sample.

When coming to the specific issue of total property returns for the market and specific segments, the absolute totality of respondents agree to the importance of this information, which indicates a significant general reality in a statistical sense (Table 6-6). It is relevant to add that in two situations, there were spontaneous references to a higher interest and usability in market yield values. Answers regarding the publication of this type of information are not as universal, but nonetheless there is a significant overall opinion across the industry that transparency serves its interests better, which is a promising sign.

Table 6-4 – Type of Information Effectively Collected

This table presents the results on the question about the type of information collected. Only objective answers were acknowledged relating a predefined list of information types. Additional types and specific comments were registered.

General types of information effectively collected- % per total of respondents



Addtional Information refered as also actively collected

• *Taxes* • *Unit costs* • *Functionality indexes* • *Consumption demand study (retail sector)*	• *Operator Sales (retail sector)* • *Effort Rates (retail sector)* • *Affluence rates (retail sector)*

Additional Single Comments

"Systematic collection of data is not a need and is not performed due to the small dimension of the market"
"There is data collection but not much systematic usage of it"
"There is not a lot of information available and much of what exist is not reliable"
"A lot of information is not reliable – many of the main sources lack in independence"

Table 6-5 –Types of Information Sources

This table presents the results on the question about the types of data sources used. Only objective answers were acknowledged relating a predefined list of source types. Results are presented in graphic form, per source and per respondent profile.

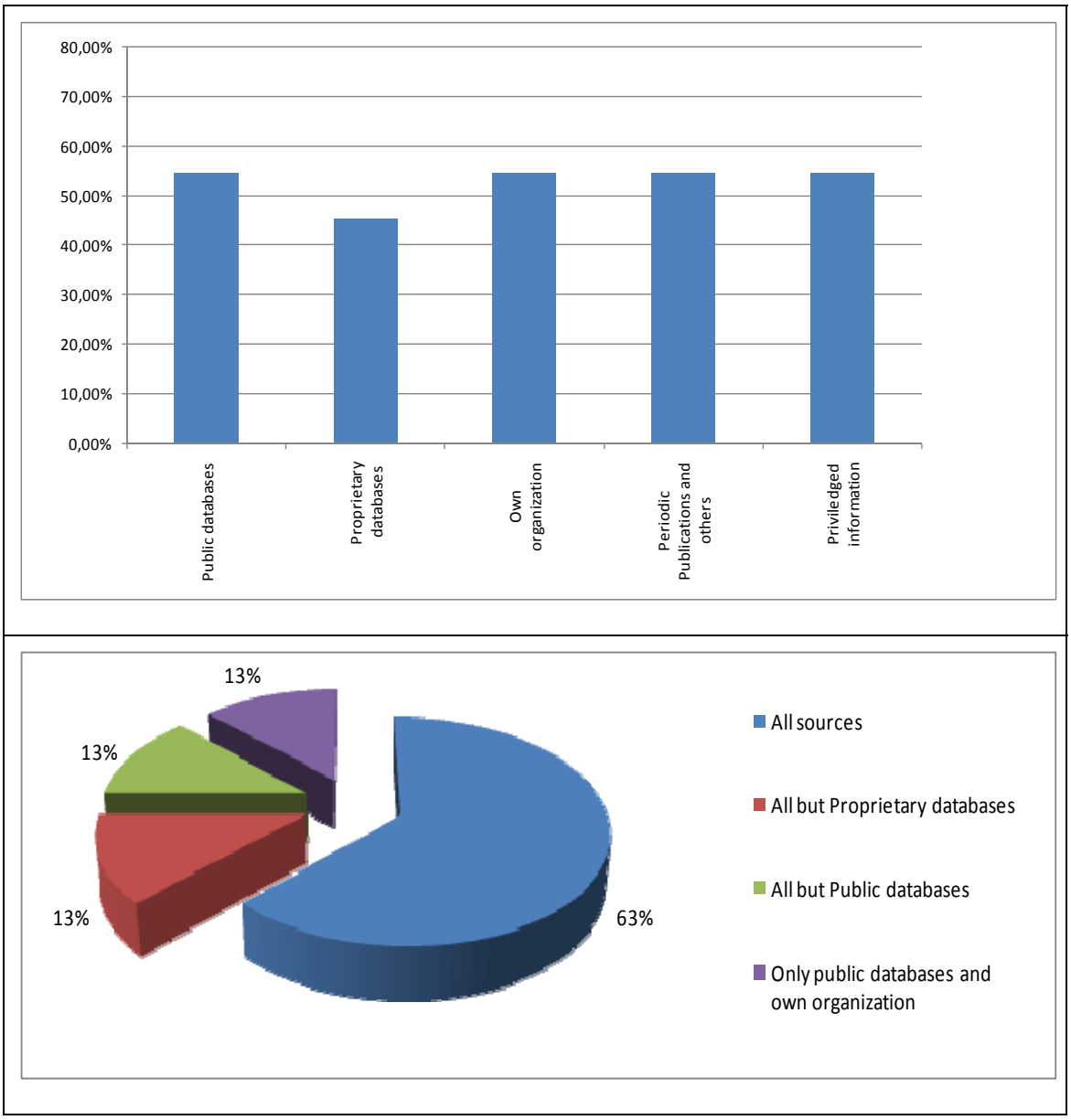


Table 6-6 – Availability, Publicity and Interest of Property Total Returns

This table presents the aggregate results of answers to questions on availability, publicity and interest of property total returns. Only objective answers were acknowledged. To test the significance of the proportion (p) of the number of positive answers to the total number of responses, a binomial test for p>1/2 was performed.

	Agree	*Disagree*	*Yes (%)*	*No (%)*	*Ztest*	*p-value*
Information on Total Returns Should be publicly available?	6	1	85,7%	14,3%	1,890	**0,059**
Information and indexes of HPRs important for Porperty Portfolio Management	10	0	100,0%	0,0%	3,162	**0,002**

Interestingly there is no consensus regarding the provider of such information, which reveals some degree of indefinition on this subject at the industry level (Table 6-7). At the individual level however, most of the respondents had quite a clear idea on this subject. Many respondents spontaneously ruled out the possibility of a specific type of provider (the question was asked in the positive form, so these were not accounted for) and referred to an individual preference. Arguments in favour of each of the choices are contraditory: the intra industry association and public institution option were generally connected with some kind of distrust or criticism regarding the IPD operation, mostly regarding independence of the national structure from market operators but also in some methodological and cost issues. On the opposite side, defendors of the private company provider option, had serious reservations about the effectivness, competence and genuine independence of sector associations and public instutions.

When addressing the supply of base information for index production, all the interviewees were in favour of their organization providing its own portfolio information (Table 6-7) for this particular purpose.

Table 6-7- Type of Provider of Total Return Information on the Property Market

This table presents the aggregate results of answers to questions on the opinion about types of potential providers of total return information on the property market. Only objective answers were acknowledged and additional specific comments registered. Multiple type selections were allowed. To test for market overall indifference regarding the type of provider of such information, a goodness of fit test against a distribution of even outcome frequencies was performed.

	Number in favour of possibility	χ^2	*p-value*
Institutional Investors' Associations	4		
Public Sector Institutions (Government or others)	2	0,368	0,54
Private Companies	6		

Additional Comments

- *"Associations within the REIF industry should supply this kind of data"*
- *"In a national perspective, sector associations would probably induce some kind of bias"*
- *"A very low efficiency level would be expected from public institutions, at this level, like in others"*
- *"Our main concern is proficiency and quality. The nature of the provider is secondary."*
- *"If the information was supplied in a compulsory way to a public entity, the universe would be more representative and return indexes would be more reliable. This data is sufficiently relevant in economic terms for this process to be established."*
- *"There is an excess of information demanded by/provided to the IPD"*

As for the specific conditions, two aspects are relevant, the first being the value that is given to this information: either a potential trade-off in services or fees is required against delivery, or alternatively the information is provided in an absolute complimentary way. Here, the positions were divided almost equally. The second and probably the most relevant is the confidentiality of data, relating to the property identification data, were a near consensus showed a natural demand for confidentiality at this level.

Table 6-8 – Conditions for Providing Own Portfolio Information

This table presents the answer to the question Conditions for providing own portfolio information. Only objective answers were acknowledged. To test the significance of the proportion (p) of the number of favourable answers to the total number of responses, a binomial test for p>1/2 was performed.

	In favour	*Against*	*Total*	*Ztest*	*p-value*
Own Organization providing information	11	0	11	3,795	**0,000**
Trading off information per services or fees	6	5	11	0,632	0,527
Confidentiality of information provided	10	1	11	3,162	**0,002**

In an overall perspective, the perception that resulted from this study is that in general terms there is still a moderate sophistication in terms of demand and management of property investment information, especially because most of the players are still mostly limited to in-border operations in a small market where more empirical, non systematic approaches keep working. In the singular cases where there is important exposure to external markets and larger portfolios, information management appears to be taken in more systematic way.

6.4.2 Appraisal

Appraisal was revealed to be a relevant subject in the perspective of managers, as expected. The opening question on this subject revealed itself to be quite a sensitive one, with most of the respondents providing careful and exhaustive explanations on their point of view. In aggregate terms, a vast majority considers that there is factual influence from the manager on the appraiser, this being a significant result in statistical terms, as evidenced in Table 6-9. Within these, most of them explicitly consider that interaction to be of a technical order, thus meaning that in many cases managers do not agree with the methodology or base assumptions behind the appraisal, which in turn induce an inadequate estimate of value.

Table 6-9 – Manager's Influence on Appraiser – Existence and Nature

This table presents the results on the questions regarding the management's influence on thr appraiser – the recognition of its existence and the identification of its nature. To test the significance of the proportion (p) of the number of positive answers to the total number of responses, a binomial test for p>1/2 was performed.

	Yes	*No*	*Yes (%)*	*No (%)*	*Ztest*	*p-value*
Do you consider that there is influence from the manager on the appraiser?	10	1	90,91%	9,09%	2,714	**0,007**
Main Reasons for Influence						
Technical Motivations/Issues	8	0	80,00%	0,00%	1,897	**0,058**
Other	0	0	0,00%	0,00%	-	-

Periods between appraisals are conditioned to regulatory terms in specific industries like REIFs and pension funds. Regarding the REIF industry, where the regulatory framework imposes a maximum period of two years between successive appraisals, most institutions tend to set this upper limit as their regular practice (Table 6-10). In fact, only one of the respondents refers to an annual period between successive appraisals. A timid potential of change of current practice is suggested by the fact that more than one third of the respondents are in favour of a reduction of this period, two referring to the one year interval as optimal and the other indicating that this parameter should be set by the market, eventually based on the reporting needs of large mix asset institutional portfolios.

Pension funds have a rigid framework set by the ISP (Instituto de Seguros de Portugal) on this subject. Properties are valued at least once a year in open-ended funds and every three year in closed-ended ones. The sole plan sponsor represented naturally referred to

compliance with these procedures. The two private equity property companies refer one year and six month periods between appraisals, respectively, referring in both cases the semester as the optimal interval and recognizing a market tendency for reduction due to investor reporting demands.

Table 6-10 - Regular Time Period between Successive Appraisal in REIFs

This table presents the results on the questions regarding the time period between successive appraisals. To test the significance of the proportion (p) of the number of positive answers to the total number of responses, a binomial test for p>1/2 was performed.

Regular time period between successive appraisal	*2 years*	*other*	*Total*	*Ztest*	*-pvalue*
Actual practice	7	1	8	2,121	0,034
Optimal situation	5	3	8	0,707	0,480

Notes: within the respondents that considered an alternative practice to the 2 year period as an optimal situation one responded the optimal situation was determined by the investor market (institutional) and two other responded that one year was the optimal period.

As for the number of independent external appraisals requested at each valuation, three different realities were found. In private equity property companies, both respondents stated that in their organizations only one external appraisal was requested as standard procedure. In all REIFs addressed, respondents mentioned the existence of two external appraisals, according to the CMVM regulation. In Pension funds, for assets valued below 7,5 million Euros, only one external independent appraisal is required, otherwise two external independent appraisals are due. In this case, the effective book valuation is the lower of the two appraisals.

In the REIF regulation, as previously discussed in Chapter 5, there are not fully objective criteria for property valuation. In general, the value of fully developed direct real estate assets should be established by the management in the interval between

acquisition price and the arithmetic average of mandatory appraisals made by certified external experts. This implies the objective existence direct influence in the quantitative measures of fund value and fund performance from the management, which in turn induces potential bias factors and raises doubts about independence and transparency issues. The important question raised here was to understand how the institutions and the managers positioned themselves regarding this specific and sensitive issue. In objective terms the question was "what are the criteria for establishing the effective value". As presented in Table 6-11, most of the respondents say that they in fact take advantage of the latitude provided by the regulation, considering the effective valuation a discretionary parameter within the legal boundaries. Only one in seven respondents had an objective and transparent criteria valuing the property by the average of the two external appraisals (which, by the way, was allegedly about to be abandoned for a discretionary one like used by his peers).

Nonetheless, additional comments reveal that this situation is considered by the respondents to be the most appropriate, for several reasons: i) appraisal quality is generally considered to be low in technical terms and end results; ii) there is a general perception in most responses of the effective use of a more conservative in valuation than the one that results from the arithmetic average of the two appraisals, in line with the accounting principle of prudence - hence, value gains tend to only be effectively accounted for when having unquestionable ground to be supported iii) the empowerment conveyed by past and present regulations regarding property valuation is a valued prerogative from which managers seem reluctant to give up; iv) the latter is mostly relevant in the case of open-ended funds, where this prerogative enables an effective control on the volatility of the unit price and its return, thus allowing the maintenance of the low risk reliable investment perception from the public and

preventing sudden massive withdrawal movements that could severely condition operations;

Table 6-11 –Method Used to Determine the Actual Property Valuation in REIFs

This table presents the results on the question of the methodology used by REIF managers for actual property valuation. Only objective answers were acknowledged and additional specific comments registered.

REIFS	*Discretionary*	*Average of the two independent valuations*
What is the method use to determine the actual property valuation?	7	1

Additional Comments

- *"Our method is discretionary and our valuation is always below each of the external appraisal values."*
- *"The actual valuation is our own criteria: either we keep the acquisition value or else we make an approximation to the average of the two external appraisal values, according to the situation."*
- *"The final valuation is our own: external appraisal is just an instrument."*
- *"The actual valuation is periodically reviewed by the management based on an objective criteria communicated to the CMVM, which relates to the status of the property, namely if it is vacant or leased."*
- *"Our final valuation is based on acquisition value added of capital expenditures and an additional that is dependent on the actual yield of the property."*
- *"Our actual valuation is discretionary –within the law and regulations – this is foremost related with the fact of the open-ended nature of the fund, which enforces a heavy liquidity constraint – demand for unit liquidation has to be cautiously regulated."*
- *"There is no quality in appraisal. Appraisers lack in adequate experience, information and specific technical skills."*

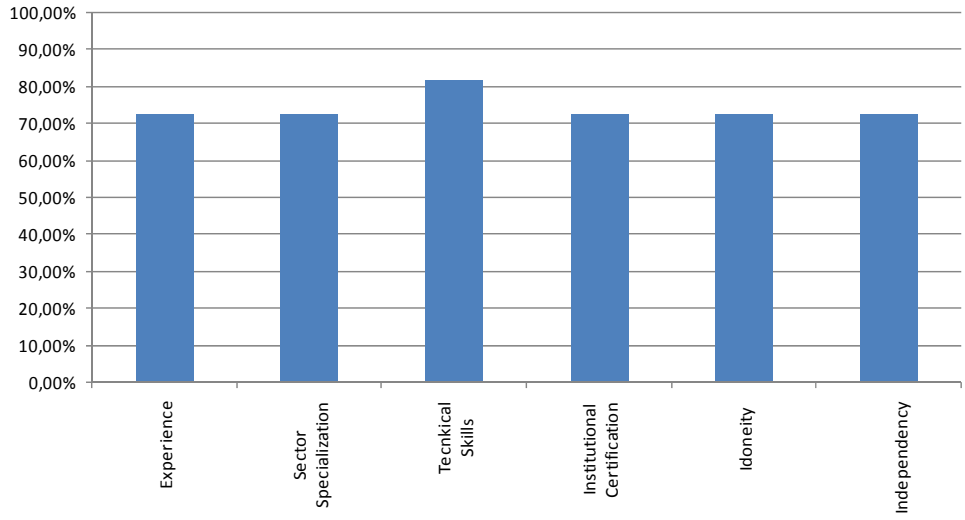
In an independent perspective, there are several sides to this significant discussion. The first is the objectiveness and coherence of the criteria behind the REIF regulation. In reality these criteria appear contradictory in substance. The high level of requirements

made on the qualifications and performance of external appraisers, together with the factual demand for the existence of two independent appraisals at a time (or even more in certain cases), seems to indicate a high level of importance of this input for the funds' operations and valuation. However, in the final valuation criteria, it only serves as an upper boundary and as reference information for the investor. In reality, it is mandatory for a property to be appraised by two different entities at least every two years or whenever there is the perception of a substantial change in its market price, but the effective value accounted in the fund's NAV (for instance the acquisition value) may remain unaltered for an indefinite period. From the perception of this reality, pertinent questions arise: are property appraisers, as specific experts, considered like true market referees or only independent information providers to the management and the market? Does the present framework guarantee the participants a reliable, independent and transparent valuation of their investments, according to the market prices of subjacent assets? To what level are the fiduciary duties of managerial societies put into question? Are the potential negative consequences of liquidity constraints of open-ended funds, as referred by Bannier *et al.* (2007), a reason to justify the present framework?

The second perspective is a purely conceptual one, related to the subjectivity and/or technical rigor of the appraisal. In fact, every appraisal is in some degree subjective and possesses some inaccuracy regarding its final goal, which is to predict a market transaction price. As evidence shows this is an issue that managers use to support the current regulatory status quo. However, as previously referred in Chapter 3, the available evidence indicates that the accuracy level of appraisals in Portugal is parallel to the most mature markets in Europe. Further certification of the quality of appraisals is the factual evidence of the two private equity property companies included in this survey, with both large national and international portfolios, and of pension funds in general, which all use external appraisals directly as asset values for every purpose.

Table 6-12 – Requirements for Appraiser Qualification

This table presents the aggregate results of answers to questions on the requirements for qualifying as appraiser for the target organizations. Only objective answers were acknowledged and the expressed mandatory use of acknowledged national or international standards was registered.



Mandatory use of Appraisal Standards/Guides		
CMVM	*IPD*	*RICS*
4	*1*	*1*

Lastly, there is an independency issue that arises from the duties of real estate investment fiduciaries. The evidence from of private equity property companies and pension funds is a strong argument in favour of the standard procedures of independent valuation in terms of the assurance of the independence and fiduciary duties of the portfolio management, independently of the potential inaccuracy level of the appraisal, which is also subjective in nature. Adding to the latter, from the factual comparison of the REIF and pension funds regulations, another relevant conclusion may be drawn: in general, open-ended REIFs, despite being a much more liquid, publicly accessible and property intensive indirect investment vehicle, have lighter constraints and much more discretionary power on property valuation than pension funds.

Requirements for appraisal qualification in target organizations are presented in Table 6-12. The results show a general concern for *a priori* selection criteria of appraisers, however with differences in substance as also confirmed by results in IPD/Imométrica (2005).

6.4.3 Asset Allocation and Property Selection

Asset allocation decisions are vital strategic frameworks for subsequent asset selection, operation and benchmarking. The nature of asset allocation decision processes in institutional real estate portfolios has changed to a large extent in recent years, as hitherto referred.

The first evidence from the present survey was that different institutions had different perspectives regarding this issue, due to their market positioning whether portfolio managers, or else as specialized asset managers[52]. The first regard asset allocation as a natural need within their operation in order to choose their portfolio structure in order to attain their objectives. The second naturally considered that asset allocation is an activity that is performed beforehand by the investor or general scope fund manager, their own diversification being ruled by specific operating capabilities. In the first category are included managers of open-ended REIFs, pension funds and private property companies with diversified portfolios. The second includes managers of specialized closed-ended funds and specialized property asset operators (e.g. retail, tourism or healthcare facilities).

[52] 'Portfolio managers' here refers to entities or institutions managing a diversified real estate portfolio and 'specialized asset managers' here refers to selectors and operators of specific property asset types.

The maintenance of traditional empirical support of these decisions seems to overshadow any tendency for the incorporation of more sophisticated assessment techniques, as shown by evidence from Table 6-13 which indicates that the manager's experience and intuition still plays a major role. Nonetheless, there is the recognition of some "improvement" potential regarding asset allocation decisions.

Table 6-13 – Use of Quantitative Techniques in Asset Allocation Decisions

This table presents the aggregate results of answers to questions on quantitative asset allocation techniques. Answers were provided in the following scale: 1- not at all; 2-slightly; 3-moderatly; 4-heavily; 5- absolutely. Sample averages and standard deviation were determined.

	min	*max*	*average*	*Std Dev*
Are your organization's diversification decisions essentially "empirical" (1- not at all; 2-slightly 3-moderatly 4-heavily 5- exclusively)?	2	5	3,89	0,78
Do you think that the decision process and the supporting quantitative techniques used in your organization are the most adequate for the maximization of results (1- not at all; 2-slightly 3-moderatly 4-heavily 5- exclusively)?	3	5	3,78	0,67

Regarding the factors that are taken into account in asset allocation decisions, Table 6-14 shows that, in general, specific information regarding the property market is more important than macroeconomic data, regardless of the significant degree of importance given to the latter by some of the respondents.

Regarding actual asset allocation supporting techniques, including simple index correlation or other more elaborate quantitative methods, the opinions on their importance or relevance of use vary considerably. In this highly technical subject, there was not a full perception that each respondent was totally aware of the main methodologies referred to and/or mastered the knowledge and the concepts behind

them. Nonetheless, many respondents show definite opinions regarding this subject, with many indicating that the market size and characteristics (limited number of players, shortness of supply) together with a lack of specific historical information make quantitative methodologies largely unnecessary and even irrelevant.

Asset allocation can be analysed with different segmentation structures, according to different return inducing factors. Table 6-15 shows a reality of current professional practice of national institutions very much in line with evidence from other markets (Worzala *et al.,* 1997). Comparison with the results from chapter 4 market reveals also a significant market perception from these professionals. Property type is perceived as the main segmentation variable, with an almost universal recognition. Location is also rather important but to a slightly lower degree. Two other variables, property size and lease contract type are also designated by a significant number of respondents. This relates also to the size and structure of the available supply, in which the number of opportunities varies inversely with the size of the property, thus making large properties rarely available. Other interesting comments were that the level of management effort required by a specific segment[53] or the existence of specific managerial know-how[54] may be relevant in a diversification decision. One of the respondents said that diversification through the dimension of the tenants' business sector was also relevant, in an intra-segment perspective.

[53] Here the most pointed example was retail.

[54] Either considering in-house knowledge or the potential of recurring to a specialized partner.

Table 6-14 - Importance of Specific Information and Techniques for Management Decisions Regarding Portfolio Diversification and Property Selection

This table presents the aggregate results of answers to questions on specific information and techniques for management decisions regarding portfolio diversification and property selection. Answers were provided in the following scale : 1- not at all; 2-slightly; 3-moderatly; 4-heavily; 5- absolutely. Sample averages and standard deviation were determined.

How important for management decisions regarding portfolio diversification and property selection is to know and evaluate each of the following aspects/data/indicators ?	*Min*	*Max*	*Average*	*Std Dev*
Evolution of Macroeconomic factors				
CPI	2	5	3,40	1,07
Consumption	2	5	3,36	1,03
GDP growth	2	5	3,40	1,07
Property market				
Offer/Supply	3	5	4,30	0,82
Demand	3	5	4,30	0,82
Return	3	5	4,00	0,82
Risk	3	5	4,20	0,79
How important for management decisions regarding portfolio diversification and property selection is the usage of the following models/techniques/procedures?	*Min*	*Max*	*Average*	*Stdev*
Index correlations	1	5	3,67	1,50
Quantitative Asset allocation de Models to support diversification decisions	1	5	3,29	1,25
Investment Analysis models to support property selection decisions	4	5	4,78	0,44
Usage of Benchmarking Models	3	5	4,67	0,50

Additional Comments

- *"Detailed Investment analysis is very important for development projects but not relevant for fully developed income properties"*
- *"Our decision supporting techniques are adequate to the national market reality"*
- *"Our organizations has a specific vocation"*
- *"Diversification in practice is also very much conditioned by opportunities that appear in a very small and restrict market"*
- *"Our current focus is on specialization of products and internationalization of operations"*
- *"We have very specialized products - Asset Allocation is done beforehand"*
- *"Asset allocation models are yet very difficult to apply in our market, but they are the future"*
- *"We are more interested in benchmarking ourselves within the REIF industry and as a financial product than within the Real Estate Market, as we have specific constraints on our operation" (REIF)*
- *"Our interest is the same as in benchmarking against the REIF industry (as a financial product) and against the Real Estate Market" (REIF)*

Table 6-15 - Diversification Variables/Parameters Used

This table presents the aggregate results of answers to questions on the diversification variables/parameters used. Only objective answers were acknowledged and additional specific comments registered.

Diversification variables/parameters	*Effectively Used/considered*	*(%)*
Property Sector	9	81,82%
Country/Regional Spread	8	72,73%
Property Size	6	54,55%
Property Age	0	0,00%
Building Status and Quality	1	9,09%
Type of Lease Contract	4	36,36%

Additional Comments

- *"Management effort required is relevant on diversification decisions."*
- *"Availability of supply is conditioning for diversification."*
- *"The number of Opportunities is related to property size. In such a small market it is not easy to buy large assets"*
- *"Size of potential investments is dependent on fund size (REIFs)."*
- *"Diversification by tenant business sector."*
- *"Know-how is a competitive advantage."*

As expected, Table 6-16 shows that the reality of asset allocation decisions is largely established on the grounds of managerial experience and intuition. However, in more or less conceptual terms, almost half of the respondents consider that quantitative asset allocation models can bring extra value to property portfolio allocation decisions, but in the end only a small minority considers using these techniques in their actual processes. There was no consistent evidence on whether any of the respondents actually used them in their property portfolio or had done so in the past. Pension funds refer to their usage only in a mixed-asset allocation context. These results are clearly in contrast with the ones presented by Worzala *et al.* (1997), where a significant part of the respondents referred to use asset allocation techniques for their property portfolio.

Table 6-16 - Actual Support of Diversification Decisions

This table presents the aggregate results of answers to questions on the actual support of diversification decisions. Only objective answers were acknowledged and additional specific comments registered.

Actual support of diversification decisions	*Number*	*%*
• ***Management experience / intuition***	8	72,73%
• ***Consider quantitative Asset Allocation models to be potentially useful in the decision making process regarding property portfolio diversification.***	5	45,45%
• ***Consider actually using quantitative Asset Allocation models in the decision making process regarding property portfolio diversification.***	2	18,18%

Additional Comments

- *"Usage of Asset allocation is not viable in our market: due to lack of information and adequate indices; Lease legal framework; Market dimension (lack of supply)."*
- *"Efficient frontier determination and duration matching of assets to liabilities are used in a mixed- asset allocation perspective"* (Pension fund)
- *"Market trend analysis is also relevant for diversification"*
- *"Exposition in certain developing markets may be objectively limited due to factors like currency specific risk"*
- *"Diversification is also obtained by investing with partners, thus reducing exposition to a specific investment"*
- *"Risk is also controlled at the financial leveraging schemes through the hedging of interest rates"*

Note: Quantitative Asset Allocation models referred: index correlation, CAPM and MPT;

On a different angle, even despite individual perspectives, both property investment analysis and benchmarking procedures are considered to be somewhat pertinent activities (Table 6-14). Regarding benchmarking procedures, it is interesting to note that some large open-ended REIFs refer to being more or even exclusively interested in benchmarking within their specific industry and not against the property market. This is justified by the respondents with specific constraints to their operations, such as liquidity impositions derived from their own structural nature. This subject is certainly linked to the valuation issue previously discussed, namely the influence that the

management valuation criteria has on return measures. Also relevant is the relationship between the benchmarking activity and the providers of total return information. Benchmarking against the market is done by comparison with property return indexes, so it is generally done by or in association with index providers. The view of each institution on the sole market provider of total return indices and linked benchmark services has a noticeable impact on the actual practice. Therefore, it is natural that answers reflect this aspect – if the benchmark provider is not trusted or considered to provide unadjusted reference, then alternative procedures or criteria may be set into practice.

Property selection is a major issue for portfolio managers. It is the activity that really implements the strategic options of investment designed for the portfolio, traducing previously set asset allocation directives. Investment analysis is reported to be performed by all respondents, as presented in Table 6-17. Among the main decision parameters identified are the classical net present value (NPV), which evaluates the excess of discounted cash-flows of the project, and the internal rate of return (IRR), which is the discount rate that sets the NPV to zero, in practice the yield of the investment. A large majority (about 82%) of the respondents refer to the IRR as a main decision parameter, while the NPV is only mentioned by less than 50%. Despite not being actually asked about the actual use of discounted cash-flow techniques or just simple perpetual income capitalization methods, some respondents specifically mentioned a preferential use of the last, except on property development projects. This indicates that they probably did not take into account any potential volatility of future cash-flows. These results are very much in line with the ones presented by De Witt, (1996) and Webb (1984) for the Netherlands and US markets respectively, both

concerning techniques used and decision parameters elected. Other decision parameters pointed to by the respondents include the intrinsic building value[55], independently of the potential yield derived from lease operations. This is justified by the existence of speculative sprees, thus showing that market yields are in many cases not entirely real or sustainable in a long term perspective. Also mentioned were the settlement of the discount rate and of property residual values, which are parameters that have a considerable influence on the analysis. Decision criteria rely mostly on the settlement of a minimum return to be attained, but also in specific criteria defined for other parameters.

Regarding risk evaluation, the most interesting result is that while most of the respondents (about 90%) claim to perform some type of sensitivity analysis, half of these spontaneously refer to the fact that, despite this procedure, risk is not a quantifiable parameter, which leaves risk evaluation to be only a scenario analysis. Nonetheless, a significant number of respondents claim that the definition of a maximum risk level is a relevant decision criterion, even if apparently only in qualitative terms. This result is very much in accordance with the evidence presented by Webb (1984), Farragher *et al.* (1996) regarding the US market, and De Witt (1996) for the Netherlands, where the authors find that despite the recognized importance of risk evaluation, many respondents consider it only in an informal qualitative manner.

Also relevant is the fact that many respondents point out a significant risk control at the tenant level, both regarding the tenant's financial capacity and also the warranties provided. The evaluation of the rent/tenant risk relation is therefore naturally acknowledged as very important for risk mitigation, which would naturally be expected.

[55] The intrinsic building value is a concept that refers to the concept of depreciated replacement cost as defined by the European *Valuation Standards (EVS).*

Table 6-17- Property Selection - Risk Evaluation and Decision Parameters

This table presents the aggregate results of answers to questions on property selection decisions, namely risk evaluation and decision parameters. Only objective answers were acknowledged and additional specific comments registered.

	Number	*%*
Organizations performing Investment Analysis for each relevant prospect determining expected risk and return	*11*	*100,00%*
Method for risk evaluation		
Sensitivity Analysis	10	90,91%
Probability Analysis	1	9,09%
Simulation	0	0,00%
No Risk quantification	*5*	
Decision variables determined and valued		
NPV	5	45,45%
IRR	9	81,82%
Decision criteria/factors		
· Definition of Minimum Return	10	90,91%
· Definition of Maximum Risk	7	63,64%
· Use of Utility functions	1	9,09%
Other comment and Decision variables referred		

- *"Discount rate and residual value are also relevant parameters in investment analysis"*
- *"Property intrinsic Value (separated from the income concept – not considering current market yields) is a basic decision variable. The property investment market has shown rather artificial/unsustainable trends that are completely dissociated from the actual economic reality"*
- *"In a shopping centre development project, the return at the opening date (considering property market value) and cost volatility factors are also relevant."*
- *"Risk is also valued on an empirical basis, regarding the Tenant"*
- *"Evaluation of Tenant Specific Risk is the most important part of risk evaluation"*
- *"Rent vs Specific risk"*

6.5 CONCLUSIONS

In this chapter a study regarding the characterization of current practice and decision-making processes used by organizations and professionals managing large real estate portfolios was presented, as another relevant aspect of the characterization of the transparency and maturity of the Portuguese property market. As in most previous research around this subject, this developed essentially through a survey carried out among institutional investors.

A specific methodology based on previous research was developed for attaining the aims set. The outlining of the main characteristics of the market under study, taking into account recent history and background, lead to the definition of a survey approach through individual semi-structured interviews to the chief real estate investment officer of each organization, in view of the small size of the target population and its structure. Specific objectives included the exploration of four main issues - information management, property appraisals, asset allocation and property selection - elected for their relevance and relation with the work developed and presented in the previous chapters. The enquiry layout was structured in order to attain the objectives set and tested on sample interviews regarding possible revision and improvement. The individual interviews were accomplished according to the defined procedure, and collected data was treated for result aggregation and statistical analysis. In most cases, the aggregated results presented beforehand, reflect a rich and vast set of objective realities that were individually commented on in the text along with their respective evidence. Nonetheless, overall analysis of the results of this survey and the general perception drawn from them is rather noteworthy, both in absolute and in relative terms.

Regarding the management of property investment information in the Portuguese market it is apparent that, with singular though notable exceptions, there is still a

moderate sophistication level in related procedures. This derives from the majority of the players still being mostly limited to internal operations in a small market, where more empirical and non-systematic approaches persist to provide acceptable results.

A vast majority of respondents considers that there is factual influence from the manager on appraisals, through an interaction of technical order between client and appraiser, as there is some evidence of manager's opinions considering the existence of low quality in appraisals, both in technical terms and end results, which goes against the thin but nonetheless existing evidence. Periods between appraisals are generally defined according minimums in regulatory terms in specific industries like REIFs and pension funds. Private equity property companies refer practices of one year and six month periods between appraisals, referring the semester as the optimal interval and recognizing a market tendency for reduction due to investor reporting demands.

Regarding the issue of the inexistence of an objective criterion for property valuation in the REIF regulation, previously addressed in Chapter 5, in the present chapter substantial evidence is presented supporting the existence of an effective managerial bias in property portfolio valuations, as previously evidenced by IPD/Imométrica (2005). Managers generally admitted to effectively taking advantage of the latitude provided by the regulation, considering the effective valuation a discretionary parameter within the legal boundaries, mostly founded in a conservative approach to valuation and in line with the accounting principle of prudence. This empowerment is a valued right which managers seem reluctant to give up, especially for allowing an effective control on the volatility of the unit price and its return, thus allowing the maintenance of the low risk reliable investment perception from the view of the public and preventing sudden massive redemption movements that could severely condition operations, as occurred in other markets (Bannier *et al.,* 2007).

Despite the recognition of some 'improvement' potential regarding asset allocation decisions, the maintenance of traditional empirical support of asset allocation decisions seems to eclipse any tendency for the incorporation of more sophisticated assessment techniques, which indicates that the management's empirical skills and intuition still play a major role. Regarding specific asset allocation supporting techniques including index correlation, market models, mean-variance optimization and other quantitative methods, the opinions on their importance or relevance of use vary considerably, with a great deal of respondents having an unambiguous opinion of actual superfluity, irrelevance or inapplicability of these, justified within the context of a small market, with a limited number of players and set of offers, together with a lack of specific historical information. These results are clearly in contrast with the ones presented by Worzala *et al*. (1997) for the US, where a significant part of the respondents referred to use of asset allocation techniques for their property portfolio.

The segmentation structures taken into account in asset allocation decisions are based on the main return inducing factors, very much in line with evidence from professional practice in other markets (Worzala *et al.,* 1997) and also with the evidence found for the Portuguese market, presented in chapter 4, revealing a significant market perception from its agents. Property type is perceived as the main segmentation variable, with Location being also rather significant, but to a slightly lower level.

On a different note, even despite individual perspectives, both property investment analysis and benchmarking procedures are considered to be sufficiently important activities. Some large open-ended REIFs refer to being more or even exclusively interested in benchmarking within their specific industry and not against the property market, which is justified by the respondents with specific liquidity operational constraints. This subject is certainly linked to the valuation issue previously discussed,

namely the influence that the management valuation criteria has on return measures, but also with the view of each institution regarding the providers of total return information.

Property selection is a major issue for portfolio managers. Investment analysis is reported to be performed by all respondents, the main decision parameters identified being the classical IRR and NPV, with a significant predominance of the first. Some respondents refer to the preferential use of simple continuous income capitalization methods over discounted cash flow techniques, except on property development projects, which may indicate incapacity to predict or consider the existence of cash-flow volatilities. These results are very much in line with the ones presented by De Witt (1996) and Webb (1984) for the Netherlands and US markets respectively, both concerning techniques used and decision parameters elected. This justifies the reference to use of other decision parameters, including the intrinsic building value (a non-market valuation), the discount rate and property residual values. Decision criteria rely mostly on the settlement of a minimum return to be attained, but also on specific criteria defined for these other parameters.

Regarding risk evaluation, despite most of the respondents mentioning the development of some type of sensitivity analysis, half of them state that, despite this procedure, risk is not a quantifiable parameter and risk evaluation is a mere scenario analysis. Nonetheless, a significant number of respondents claim that the definition of a maximum risk level is a relevant decision criteria, even if apparently only in qualitative terms. This result is very much in accordance with the evidence presented by Webb, (1984) and Farragher *et al.* (1996) regarding the US market, and De Witt (1996) for the Netherlands. In practice, risk control is made at the tenant level, with the evaluation of the rent/tenant risk relation being therefore naturally referred to as very important for risk mitigation, which would naturally be expected.

CHAPTER 7 - CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

7.1 SUMMARY AND CONCLUSIONS

The nature of what may be encountered when addressing a foreign market in a perspective of inducing local real estate investment is mostly related to the concepts of maturity and transparency. These relate to the main factors that shape the market reality - structure, professionals, information and regulation - involving and influencing all of the property market's stakeholders: owners, investors, lenders, occupiers, developers and service providers.

A mature market is a complete and well developed trade environment that includes a structure of players, consultants and institutions that provide it with continuous, stable and qualified activity, also credited by the existence of extensive and significant information flows and research activity over it. Development in general can only emerge from the integration of knowledge and information, and the real estate market is no exception. In leading mature markets, like the US and the UK, there is a consistent body of knowledge on property investment and finance and an extensive amount of quality information regarding this asset class. A skilled academic community is heavily committed to the development of specific real estate adapted models that may overcome the main problems that arise from the application of traditional theories developed on liquid securities markets to this asset class. The professional community on its side is attentive and receptive to these developments and important interaction between academia and industry is noticeable. However, to some extent, common practice of asset allocation decisions, investment selections, maturity decisions and other, in a property portfolio, still relies heavily on qualitative and subjective personal judgment, experience and intuition

The development of interest in other markets, especially in other EU countries is noticeable, may it be driven by internal agents or by the internationalization phenomenon, but production is much more scarce and potentially proportional to the size and interest that each given market has on the overall scene. In the Portuguese commercial real estate market there is a general perception of a significant evolution in the last twenty years, especially in the last decade, involving many central issues: the market's structure, tax regulations and legal framework, the market's players and the related professionals, internationalization phenomena, nature of demand and supply, among several others. However, some aspects have been quite disregarded, or maybe their development has started in recent and yet hesitant fashion. Among these is certainly property finance research which is tentatively emergent. As a consequence, there is almost no consistent evidence allowing for a rigorous characterization of the Portuguese property market, especially in terms of its present maturity and transparency level, in order to better evaluate the potential of attracting international investment.

This research has addressed these major issues in order to provide a significant contribution for this characterization, pointing out potential development directions, but also aiming at being a base and inducer for the development of consistent and more intensive future research on the Portuguese property market. In this concluding chapter, the key contributions of this thesis are emphasised. Also, the main empirical findings described throughout the previous chapters are summarized. Investment and market implications of the research findings are then discussed. Finally, limitations of the study and topics for future research are pointed out.

The first relevant contribution of this study, is its exclusive focus on a largely uncovered specific market reality, with an extensive and comprehensive approach, that are, to our knowledge, unprecedented. This path has proven to possess the apparent advantages and

real hardships natural to finding your way in a desert environment. In fact, the natural perceptible diversity of potential development paths is overshadowed by the factual inexistence of specific references or starting points and by the difficulties of finding and validating significant market information and data in such a context.

Secondly, this study provides the first independent characterization of the nature, constitution and scope of the available information on return of the direct and indirect Portuguese real estate market. From this, specific research on the systematic relevance of the typical segmentation structures within the Portuguese and Iberian direct property markets is developed, which is also to our knowledge and despite the existing data limitations, an original development. Moreover, an analysis of significance regarding return components was performed, for a better understanding of the true factors that condition them.

Following on a very limited number of specifically relevant contributions, a rather detailed analysis on the time series data available for the return of the mounting REIF industry, one of vital importance within the Portuguese real estate market as the main indirect property investment vehicle available, was also developed and presented. It includes original developments and contributions of time series analysis, return distribution analysis, research on endogenous and exogenous explanatory factors and on eventual evidence of short and long term performance persistence. These make available a comprehensive basis for future research on performance prediction and attribution models of this very specific asset class and for other related developments like the ones related to regulatory issues. In fact, a great deal of attention is given to the regulatory terms regarding fund unit valuation and liquidity and the identification of consequent overall inefficiency though potential bias effects in return distributions,

which in fact is a well reported perception of many market agents, until now without very little rigorous research evidence to support it.

As a final objective and original contribution, the first portrait of the management practices of Portuguese property institutional investment professional community, concerning asset allocation decisions, property selection, appraisal and information management on the development and support of investment decisions was developed through a representative survey, extensively presented in this documented, analyzed and compared to evidence from other market realities.

After a brief foreword, developed and presented in chapter 2, consisting of a general qualitative characterization of the national real estate market, including both the present reality and the historical background and evolution of institutional investment, which aimed at providing a better understanding of the Portuguese local and specific reality, and a background reference for the subsequent chapters, chapter 3 presents an overview of the global state of the art on real estate investment analysis, focusing in more detail on the backgrounds of the present research. Firstly, the discussion developed around the subject of time series analysis of property indexes integrated all relevant aspects of index construction methodology, taking into account this asset class specificity, the application of the most recent econometrical models, relating heavily to the analysis of direct and indirect Portuguese real estate market index time series presented in chapters 4 and 5. Besides the issues around quantitative performance, the detailed discussion on the previous research regarding the characterization of professional practice of property portfolio managers, relates to the study presented in chapter 6, which aims at establishing the level of sophistication of property portfolio managers in the Portuguese Market. The evidence offered of an absolute contrast between the virtual inexistence of

academic property management research in Portugal and the reality of other developed markets may provide with basis and reference for future nationally-based research.

The next step was the base investigation of explanatory power of the IPD splits of the Portuguese real estate market about property total returns and also of return components, with yearly data from 2000 to 2004. This comes as relevant issue as they are used as a basis in portfolio construction and analysis. Results show that the structures based on Sector differentiation are generally significant and that regional spread or location does not appear to be a significant factor to condition property returns in this period. This evidence supports the argument of the importance of diversification through the sector, both in the Portuguese market and even in an enlarged Iberian context, similarly to the reality found by Devaney (2003), Lee and Devaney (2004a) and others for the general UK market. The findings of Lee and Devaney (2004b) in a pan-European context, in which the country factors are more relevant than sector ones, are not conclusive for the Iberian market, so they do not factually contradict the evidence from this study. Regarding the consideration of the analysis for return components, relatively disregarded in previous related studies in other markets, it is concluded that most of the structures only describe enough systematic pattern to be worth using for the income component of return. The natural inherent implication is that different structures may be needed to explain different return components.

After the direct indices, we focused on the indirect market which is essentially formed by REIFs. The detailed time analysis designed and developed, included trend analysis, descriptive statistics, return distribution analysis, variable interrelationship analysis at the class and fund levels and finally, analysis of short and long term performance persistence. Strong evidence of behavioural heterogeneity across the industry and even within its subsectors was presented. As for return distributions, evidence of and non-

normality is rather overwhelming, in line with the findings of Myer *et al.* (1991), Byrne *et al.* (1997), Maurer *et al.* (2004) and Coleman *et al.* (2005) on appraisal based property indexes of other markets. However, there is not a regular pattern for the type of deviations from normality encountered. This suggests the importance of endogenous factors at the fund level in performance explanation, namely the potential fund mispricing through discretionary management individual criteria, which is apparently more significant and different in nature than the one related by Redding (2006) for the UK market.

Structural differences in the nature of open-ended and closed ended funds were analyzed and discussed, and justified in relation to the difference in portfolio structure and liquidity constraints. Open-ended funds exhibit in general low volatility, very high levels cross-correlation and significant autocorrelation at lags greater than one year, suggesting very strong intra-industry resemblance between investment strategies and also a greater and longer serial dependence of returns than general valuation based indices in other realities. As for exogenous variables, the IPD indexes were the only ones that revealed significantly high levels explanatory power of open-ended funds' returns, although in rather different terms from fund to fund. Closed ended funds present higher volatility, a tendency for a fat-tailed nature of their distributions, which appears to be mainly due to sparse valuation inputs. Also very low levels of autocorrelation and cross correlation, not significant in a statistical sense, were found. This reveals behavioural individuality, which can be derived from structural differences from open-ended, like smaller average size, riskier investments, defined maturity, fewer liquidity and leveraging constraints, all of these leading to very sparse, non periodic, effective property revaluations and consequent great practical differences in the reality reflected by return measures.

Finally, the most relevant and robust finding in this chapter is a strong evidence of both short and long term performance persistence within the overall property fund industry and for the restricted universe of open-ended funds. For the set of closed-ended funds, however, there is evidence of short term persistence but in a longer term the indications of performance persistence are only truly relevant for the "cold hands" phenomena, which may result again from the main structural and regulatory differences between these two classes of funds. When considered individually, a large number of funds exhibit systematic characteristics of superior or inferior persistence, or in other words are either systematic losers or systematic winners. Results are more robust for short term persistence than for long term persistence, which in many cases is purely a case of a smaller number of observations. In some cases, funds show performance reversion after short continued periods of persistence up to 6 months. Interestingly, little difference in results occurs when changing from the global universe to the fund class universe, so an open-ended repeat winner (loser) is a repeat winner (loser) in any league. This evidence relates to previous findings in other realities like Devaney *et al.* (2004), Graff *et al.* (1999), Lee and Ward (2000) and Lee (2003), but it is worth noticing that evidence of persistence within the Portuguese REIFs is much more significant than in any other cases, either for property funds in the UK or for appraisal based indexes in other markets.

Finally, considering the findings previously summarized, the focus was put on a survey-based study regarding the characterization of current practice and decision-making processes used by organizations and professionals managing large carried institutional real estate portfolios, as a complementary element of the characterization of the transparency and maturity of the Portuguese property market. Individual semi-structured interviews to the chief real estate investment officer of each organization covered four main issues: information management, property appraisals, asset allocation and property

selection, elected for their relevance and relation with the work previously developed. The sample of interviewees represents certainly more than one half of the institutional property investment market. In most cases, the results obtained, reflect a rich and vast set of objective realities that were connected with the previous research, being the first the apparent evidence of moderate sophistication on property investment information management, which may be related to the size and scope of operations of national players.

One of the most relevant findings is the recognition of factual influence from the manager on appraisals, through an interaction of technical order between client and appraiser. This derives from a recurrent view of low quality in appraisals by managers, which goes against existing evidence (IPD/Imométrica, 2005). Also, substantial evidence is presented for supporting the existence of an effective managerial bias in REIF property portfolio valuations, as previously evidenced by IPD/Imométrica (2005). Managers generally admitted effectively taking advantage of the latitude provided by the regulation, considering the effective valuation a discretionary parameter within the legal boundaries, mostly founded in conservative approach in valuation in line with the accounting principle of prudence. This empowerment is a valued right of which managers seem reluctant to give up, especially for allowing an effective control on the volatility of the unit price and its return, thus allowing the maintenance of the low risk reliable investment perception from the public and preventing sudden massive redemption movements that could severely condition operations, as occurred in other markets (Bannier *et al.,* 2007). All these findings are in direct connection with the ones presented in Chapter 5.

Despite the recognition of some development potential regarding asset allocation decisions, the management's empirical skills and intuition are still rulers. Specific asset

allocation supporting techniques including index correlation, market models, mean-variance optimization and other quantitative methods, are by many considered superfluous, irrelevant or inapplicable, which is justified within the context of a small market size, with a limited number of players and set of offers, together with a lack of specific historical information. This reality is clearly in contrast with the one presented by Worzala *et al.* (1997) within the universe of US pension funds, where a significant part of the respondents referred to use asset allocation techniques for their property portfolio. The segmentation structures taken into account in asset allocation decisions are based on the main return inducing factors, very much in line with evidence from professional practice in other markets and also confirming the evidence presented in chapter 4. Sector is perceived as the main segmentation variable, with regional spread being also rather important but to a slightly lower level.

Property selection is a major issue for portfolio managers, being the main decision parameters identified for investment analysis the classical IRR and NPV, with a significant predominance of the first. Some respondents refer to the preferential use of simple continuous income capitalization methods over discounted cash-flow techniques, except on property development projects, which may indicate incapacity to predict or consider the existence of cash-flow volatilities. Concerning techniques used and decision parameters elected, these results are similar to the ones presented by De Witt (1996) and Webb (1984) for the Netherlands and US markets respectively. Regarding risk evaluation, despite strong evidence on the development of some type of sensitivity analysis, there is a significant expressed recognition that risk is often not a quantifiable parameter, turning risk evaluation into a mere scenario analysis. Nonetheless, a significant number of respondents claim that the definition of a maximum risk level is a relevant decision criterion, even if apparently only in informal and qualitative terms and that effective risk control is largely made at the tenant and costs level. This result is

again very much in accordance with the evidence presented by Webb (1984) and Farragher *et al.* (1996) regarding the US market, and De Witt (1996) for the Netherlands.

The main empirical findings of the present work have important implications for investors, but also for other players of the property and financial markets. Firstly, the universal primary segmentation structures, especially the sector splits, should be used in a top-down allocation strategy as they appear to be generally significant for explaining returns. In terms of indirect investment, there appears to be a significant inefficiency of the market, despite the availability of consistent related information, especially for open-ended REIFs. There is strong evidence of high predictability and serial correlation of returns, and more importantly of persistence of performance, which indicates that active management strategies based on auto-regressive models such as the ones presented by Silva (2005) and the choice of funds that have performed better in the past have a considerably higher winning potential, contradicting the traditional assumptions. However, the factor of subscription and redemption costs was not addressed in this study, which may have potential implications on the effectiveness of active strategies in a short term perspective, but does not implicate on choices based on the factual long term persistence.

Regarding the community of indirect investors through public open-ended REIFs, there seems to be a lack of sophistication in demand, and the factual existence of passive strategies based on a preference for very low risk applications, almost like REIFs being a surrogate for common bonds or gilts. This may explain the maintenance of consistent long-term poor performers, despite sometimes these being the biggest funds and even the ones growing in size, without evidence of problems related to liquidity constraints. In this reality, the 'artificial' maintenance of a low volatility in returns, through

management appraisal smoothing is justifiable on the status quo of the industry, but in any case, in our opinion, not sustainable if there are true concerns regarding transparency and capacity to attract more investment to the public REIF industry. The fact is that the industry of REIFs is growing in the private closed-end side, and not much in the public one. The potential solutions maintaining the REIF model will all have to deal with the liquidity problems that arise from redemptions. Bannier *et al.* (2007) show clearly that the best ways to pursue this objective are the ones that increase transparency of the fund's fundamental value and of the management, namely through market-based external valuation valuations in shorter assessment periods (6 months are suggested) and credible fund rating. However, the introduction of the REIT model, common to many economies around the world with developed property markets, in substitution of public REIFs, is probably the most indicated solution, as it would increase dramatically the liquidity of the commercial property market, both for equity and debt based securities, the efficiency of investment decisions and enable a wider and easier access to smaller investors.

The results of this research suggest that the Portuguese real estate market exhibits in aggregate terms a moderate level of maturity and transparency, in line with research like Jones Lang LaSalle (2006a) and Lee (2005), but gives a comprehensive and detailed insight on the specific issues that relate to this, and that in fact are not all at the same evolutionary level. In some cases there are still rather primitive realities but in other the level sophistication, information and quality of practice is in line with many developed property markets, as illustrated through the survey developed. From this, a relevant issue stands out, relating to the specific nature of the market in terms of size, offer and demand. If national players are to be limited to the national market, strong arguments can be drawn in favour of the maintenance of the *status quo*. However, if there is a challenge for internationalization of operations, a strong desire to attract cross border

investors and a need to compete against incoming foreign players, there is an ever continued need for evolution. The specific empirical findings of this work in several subjects, despite the limitations discussed ahead, will consist of a basis for further development by agents and researchers interested in this market.

7.2 SUGGESTIONS FOR FUTURE RESEARCH

As previously evidenced the potential paths for future research on the Portuguese property investment market are immense. Despite the existence of this vast field of opportunity, in these last paragraphs, only the ones that may derive more directly from the present work are addressed, namely relating to its shortcomings, limitations and natural links.

As in any study, this one has tangible limitations, which can be aggregated in two main different categories: limitations resulting from the data and limitations related to the methodologies used. The first generally arise from the factual existence and availability of the data itself, rather than from any eventual problems of lack of quality or non-idoneous sources.

As previously recognized, limitations of data availability on the direct market series were a considerable problem for this study, which did not allow it to address the problem of time stability in the significance of the segmentations structures tested. Despite results being generally consistent, as the F-tests used are sufficiently robust to conform to situations of non-normality and unequal variances, the findings for subsector segmentations should only be considered tentative due to the very small sample size and the consolidated nature of the returns used may lead to significant bias, due to lack of control of the baseline sample characteristics. An analysis at the property level would certainly be preferable, so an evident future path for further research is a similar

procedure with such base sample, naturally wider and more significant, in order to confirm these findings and also to explore the time variable in the significance of the factors that are present in common property splits.

Concerning data availability for the indirect market, in general the sample is rather significant for shorter periods but more limited in longer ones. In some cases the reliability of the statistical estimation may be questioned and also there is a chance that features of very long-term behaviour potentially related to economic cycles might have been missed. Naturally, the availability of the data was conditioned by the market's youth, which implies that the series on historical returns are not as long and significant as desirable. This is a problem that will naturally be overcome in the near future, which enables new and renovated research perspectives.

Regarding the survey, the sample was very significant in terms of share of market representation, despite the small absolute number of respondents, which is a consequence of market size. Naturally as the market becomes more mature, agents will get more acquainted and interested in these initiatives and their results, which will enable significant future developments and additions.

Regarding the methodological issues, within the analysis of structures from the direct market, a regressional factor model could have been used, in line with Lee (2001) and Lee and Devaney (2004a). However, here the real issue for development are the data limitations that lead to the base hypothesis of yearly sub-segment level data being a good proxy for individual asset performance on an aggregated five year period. For the REIF time series analysis, despite the extension of this study, much remains to be done. More detailed analysis on endogenous factors that enable return predictability like portfolio structure, investment strategies, size and management are obvious vectors for development.

Despite of the robustness of the results regarding performance persistence, further investigation on this issue is a natural and relevant research path, through the use of other measures of performance, study of different periods and the consideration of other types of models for persistence evaluation, like cross-sectional regression analysis.

Finally, in terms of the practice of the professional community, from this work and from previous research, many developments are possible. In fact the many factual results from the survey provide extensive evidence and answers, but also lead to a great number of subsequent questions on the various subjects addressed. For each of the four, a specific survey could be made, in order to complement this one, clarify some of the findings, as evidenced by the specific similar research in other markets reviewed before. Also and most naturally, the temporal evolution of the reality that was portrayed in this study is of great interest for defining evolution trends and pace, but again for comparison purposes.

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