LUND UNIVERSITY
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ASSET ALLOCATION DECISIONS

Do investor groups in Sweden differ in investment behaviour?

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Abstract

We investigate investor heterogeneity between private, institutional, commercial, government and foreign investor in the Swedish market. OLS-estimation using dividend yield and term spread as regressors reveal no clear results. VAR-analysis to investigate lead-follow relationships between investor groups indicate that foreign follows private and commercial investors, though the result is problematized by a lack of connection with institutional investors. We cannot substantiate earlier results achieved in the field markets by Cohen (1999) in America and Drobetz, Kugler, Wanzenried, and Zimmermann (2009) in Switzerland.

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Contents

1. INTRODUCTION

> ”The literature is difficult to absorb. Different articles use different techniques, variables, and time periods. Results from articles that were written years ago may change when more recent data is used. Some articles contradict the findings of others. Still, most readers are left with the impression that ’prediction works’—though it is unclear exactly what works.” – (Welch & Goyal, 2008, p. 1456)

The ability to predict stock and bond movements is generally thought to be impossible in textbook treatments of markets: if they exhibited predictability, would not investors exploit such tendencies? Beginning in the 1960’s and continuing on, researchers noted that excess returns on stocks could partly be explained by regressing of very simple variables such as dividend yield and various term structures. Much of this research was anchored by Eugene Fama, one of the 2013 Nobel Laureates in Economics, and perhaps because of that the topic has continued to be studied to this day with little in the way of consensus reached. Aside from studies directly on the stock and bond markets in response to the apparent predictability inherent in these variables, little seems to have been done to examine other aspects of their behaviour.

This paper attempts to examine how different investors react to changes in the macro environment of the Swedish economy, and whether there are any differences between the different investor groups. Previous studies on the subject by Cohen (1999) in the United States and Drobetz et al. (2009) in Switzerland have shown that private investors in large part sell (buy) equity during business cycle troughs (peaks), while institutional investors act as a balancing force counteracting private investment. The studies differ somewhat in their approaches, and find conflicting results over how bond holdings are affected, but are otherwise similar in their conclusions. The purpose of this paper is to try to replicate the result of the studies in the US and Switzerland on the Swedish market, and to estimate the differences in behaviour of different investor groups.

We impose several limits on our paper in light of this objective. First, we consider only an OLS-specification adjusted for heteroscedasticity and autocorrelation when performing our regressions, despite the extensive development of for instance ARIMA and GARCH models made during the 20th century suited to better deal with these types of data problems. Secondly, there are many potential investor groups to research in our data set, but to avoid issues of data dredging we focus on only five large representative groups.

While we achieve some significant results related to separate investor groups and how they allocate their funds, we cannot substantiate the previous research done on investor behaviour. In particular, institutional investors appear to act irrationally, while commercial companies benefit on this irrational behaviour. A few time series, most notably commercial bond holdings, display fundamental problems that disallow us from drawing statistically relevant conclusions as to their movements. Private investors, perhaps the most interesting group, reveal few significant results, but do generally tend towards irrational behaviour. In terms of lead-follow relationships and who acts as a first mover in the market, we find that foreign actors follow domestic private and commercial actors. We are hesitant to draw any conclusions from this result, as they do not follow institutional investors at all.

In section 2 we account for and discuss prior research within this particular field. We continue in section 3 by expanding on the relevant theory underlying the area of interest. In section 4 we present and discuss our data, in section 5 we present our methodology for performing our analysis, and in section 6 we present our results and discuss them. Lastly, we conclude our paper in section 7.

2. PRIOR RESEARCH

The field of investment behaviour by different investor groups is only sparsely developed, with some notable research conducted. Beginning with Cohen (1999) testing for two investor groups in the US, the field is then studied in further depth by Cohen, Gompers, and Vuolteenaho (2002). Using data for Switzerland Drobetz, Kugler, Wanzenried, and Zimmermann (2009) analyse in a similar fashion three investor groups, allowing for a more fine grained approach. Drobetz et al. also perform a lead-follow analysis in order to see which group acts first. Both Cohen and Drobetz use dividend yield and term spread as a proxy measurement for the business cycle, but the measure has been criticized by Welch and Goyal (2008) as lacking significant explanatory value.

In the US, Cohen (1999) tests the different behaviour of two stylized investor groups, individuals and institutional investors, based on data from 1974-1995. The result is evidence of investor heterogeneity, a term for when all investors act not accordingly to one representative agent, thus different investors react to market information differently. Cohen also finds that private investors sell their equity holdings in business cycle troughs, despite evidence that gains from equity are highest during such times. He relates this finding to the proposition that private investors exhibit decreasing relative risk aversion, and in a slow economy labour income becomes increasingly risky to rely upon. Institutional investors act here as a stabilizing force, buying from private investors who wish to sell.

The topic was further expanded on by Cohen et al. (2002) wherein they examined how private and institutional investors react to cash-flow news, observing that the market generally underreacts to such news. Their findings indicate that institutional investors are more adept at utilizing these events, buying stock from private investors as a result of positive cash-flow news, but not in the case of stock price appreciation without such cash-flow news. This indicates not just a portfolio readjustment effort on the part of institutional investors in response to price changes, but a concerted effort to exploit the market underreacting. This is seen as either a sign of private investor irrationality, buying stock in response to price increases regardless of the underlying reasons for said stock increase, or as a rational response to an as-of-yet identified risk relevant to private but not institutional investors.

Drobetz et al. (2009) perform a similar analysis on Swiss data and receive similar results apart from different bond acquisition behaviour. The Swiss data reveals that private investors reduce their holdings in both equity and bonds during business cycle troughs. Their analysis further separates commercial from institutional investors, and find that they correspond well to private investors in behaviour, albeit react to news faster. Both Cohen (1999) and Drobetz et al. (2009) use dividend yield (see section 3.3) as a predictive measure of future business cycles, and find a statistically significant relationship used to predict future business cycles.

Other papers criticize the value of dividend yield, finding no significance of the variable. Welch & Goyal (2008) tested dividend yield on monthly US stock data from several time periods and found no significance in prediction value. Their paper tests the significance of dividend yield on a full sample of 1872-2005, as well as the sample period 1927-2005, and find no real prediction power of dividend yield.

3. THEORY

3.1 Efficient Market Hypothesis

The efficient market hypothesis (EMH) has been the cornerstone of asset pricing since it was first, in essence, developed by Eugene Fama. In the words of Jensen (1978, p. 96), the hypothesis is most easily described as

> "[a] market is efficient with respect to information set θ_t, if it is impossible to make economic profits by trading on the basis of information set θ_t."

The information set θ_t normally refers to one of three categories, as named by Fama (1970, p. 383), commonly referenced when discussing the EMH:

1. **Weak:** All historical information is accounted for in the stock price, but nothing else.
2. **Semi-strong:** All historical and publicly available information is accounted for. This includes all information included in the weak specification.
3. **Strong:** All information, even that belonging to insiders, is included in the stock price.

Which of the three categories should one be concerned with? The three categories represent a tiered system, whereby each subsequent tier has more stringent requirements in order to hold. Strong efficiency is not a very likely scenario to observe due to widespread legislation in the developed world forbidding insider trading. Similarly, the weak form in itself is a naïve form of price setting that completely ignores the effects economic shocks of any kind can have on the current price of assets.

There may however be additional amendments one could make. For instance, EMH operates under the assumption that information is costless to obtain, and that no transaction costs exist. These assumptions are of course not reasonable to assume to hold in practice. This would lead to a situation where information is only acted upon if the cost to obtain said information and act on it would not exceed the possible gains from using it (Beechey, Gruen, & Vickery, 2000).

Beyond these categories, the EMH does not provide a model framework to test it within. Instead, researchers aiming to conduct empirical tests on the EMH must perform a joint hypothesis test of whether markets are efficient and whether their selected model used to test the EMH is properly specified. This is known as the "joint hypothesis problem" can lead to what is called the bad model problem when interpreting the results of any model (E. Fama, 1970). The key issue is that when evaluating the results of a model, it's fundamentally impossible to determine whether the results arise because EMH holds or because of the model specification.

The Efficient Market Hypothesis leads to several predictions of asset behaviour, the most relevant for this paper being that asset prices will follow a random walk around their intrinsic value. Note the key aspect of a random walk around an intrinsic value; it does not predict a pure random walk in prices. This is intuitively straight forward. A random walk is when any variable randomly changes as time changes. Investors, hoping to make a profit, try to accurately predict what any asset it actually worth at time t. Since the intrinsic value of an asset is unknowable, or at least subject to many practical problems in ascertaining its value, individual investors will disagree on what this actual intrinsic value is. This turns out to be a random walk because all available and relevant information is being used by efficient investors who try to beat the market, but since they disagree on the exact value an asset should possess, the actual value will sometimes be higher, sometimes lower, depending on what all investors in the aggregate think (E. Fama, 1965). No information can be correctly evaluated by any one investors, and any individual investor may be wrong, but in the aggregate they are approximately right, leading to the random walk behaviour around the intrinsic value.

While this prediction has been proven in many papers (E. Fama (1965), Crouch (1970)), one discovered anomaly is that stocks exhibit mean-reverting behaviour over long horizons (Beechey et al., 2000). One of these articles is a paper by E. Fama and French (1988) titled "Dividend Yield and Expected Stock Return", which forms much of the basis for the work in this paper and the papers preceding ours. It is discussed further later in section 3.3.

Much of the literature on EMH is at this point in time rather old. The theory first appeared in the 60's and gained traction and wide-spread acceptance in the 70's. Previously mentioned anomalies started to appear in the 80's and have since then come under increased scrutiny, though it still provides a good starting point for asset analysis (Beechey et al., 2000).

3.2 The Representative Agent

The representative agent is a recurring feature in the field of economics, the idea that any number of agents can be represented by only one agent, hence the name, such as Lucas (1978) model or the original use, put forth by Marshal in 1920 (Hartley, 1996).

The model is a convenient way of dealing with the problem of the countless economic agents, whether consumers, firms or some other form, whose actions are invariably intended to be explained by an economic model. With a representative agent however, all actions can be easily attributed to one agent, simplifying any analysis. The representative agent does not assume that all agents are in fact equal, only that it explains an aggregate version of all agents. As Hartley (1996) explains, this is not always straightforward, and however one aims to formulate this representative agent the results are not necessarily accurate of the underlying agents.

Our paper, and that of Cohen (1999) and Drobetz et al. (2009) before us, proceeds with this line of reasoning in mind. The aggregate economy contains a host of different economic actors, and we attempt to divide them and determine if the different investor classes respond differently to changing economic outlooks.

The first potential division to examine is whether to study private and non-private investors as distinct entities. This seems like a reasonable assumption. After all, the entire literature on principal-agent problems highlights the problem any such relation faces in incentivising the agent in behalf of the principal to act in the principal's best interests. For a specific example, pension funds manage money provided by workers until their retirement, and the large majority of said funds are outside of individual control until retirement (allmän pension). In a similar but also distinct way, insurance companies are primarily concerned with hedging risks. Private individuals, meanwhile, employ insurance companies specifically to avoid the need of hedging, whether by choice or because they lack the sufficient funds to hedge properly. Thus it seems very reasonable that private investors behave distinct from non-private investors. Cohen (1999) furthermore points to investor irrationality (whether by private or institutional) as a reason for separating various investor groups.

Are further divisions necessary? Cohen (1999) argues for this proposition. Theoretically he bases this proposition on three things: similar regulatory framework for all institutions in tax codes and laws, agency problems are similar and utility functions are probably more similar among institutions than compared to private investors.

The similarity of the agency problems seems intuitively true: all fund managers, regardless of employment, are handling resources not principally theirs and would face the same agency opportunities, and the other two are at least difficult to quantify at a glance without detailed study (the latter about utility all but impossible to verify empirically). Still, we find it prudent to look at non-private investors at a more detailed level. Foreign capital likely behaves differently in a small open economy like Sweden compared to the rest of the world, not the least because during several years of our sample period Sweden was an object of interest for its stable finances respective to the rest of the world during the financial crisis (Carlstrom, 2013). The behaviour of foreign investors may be similar to their respective actors in the Swedish economy, but are likely reacting in response to much different variables and situations within their home country than within the Swedish economy. Similarly, commercial companies are likely to hold equity simply for the ownership it grants of subsidiaries, at least assuming the venture is profitable and beneficial to the overall business.

3.3 Dividend Yield (D/P)

The dividend/price ratio of a stock. The dividend is computed on the dividends paid in the previous year, while the price is the current listed value of either the company of the market, depending on what scale it's measured (Lewellen, 2004).

According to several articles (see E. Fama and French (1988), E. F. Fama and French (1989), Lettau and Ludvigson (2001)), dividend yield can be used as a predictive measurement of future stock prices, and is used by Cohen and Drobetz et al. as a proxy for future business cycle highs and troughs. The theory behind the predictability of the measure comes from either a rational model as defined by the Efficient Market Hypothesis or an irrational one.

The rational model, compatible with Efficient Market Theory and used by Fama & French, postulates that the dividend yield is a measure of risk in the economy (E. F. Fama & French, 1989). Increasing systematic risk causes a fall of stock prices, to compensate buyers for taking on stocks in a higher risk environment. As prices fall, the dividend yield ratio naturally increases, assuming unchanged dividends. Dividends usually vary little, so this is a reasonable assumption (Cochrane, 1992). Also assuming autocorrelated mean-preserving stock prices, a higher dividend yield can indicate a future increase in stock price (E. Fama & French, 1988).

The irrational model holds that dividend yield is a measure of the over- or undervaluation of the stock. A high dividend yield ratio suggest a previous negative price shock, causing the stock to be undervalued, and suggesting a stock price increase in the future. The same reasoning hold for low dividend yields, indicating lower future stock prices. Dividend yield has very low explanatory power in the short term, often estimated at 3%, but is much more significant at horizons of two to four years (E. Fama & French, 1988, p. 3).

The dividend yield measure has received criticism for low explanatory value in recent times. E. F. Fama and French (2001) find that in data obtained from the CRSP (Center for Research in Security Prices), commonly used for asset price research on US assets, the amount of companies paying dividends has decreased steadily since 1978 from 66.5% to 20.8%. It is increasingly larger and more profitable companies that pay out dividends, as opposed to small or investment heavy companies. Several studies find that dividend yield does not hold up to closer scrutiny. Welch and Goyal (2008) find that the dividend yield has spurious explanatory power, with a few periods (the Great Depression, post-World War II-1958, the first Oil shock of 73-75) offering explanatory power, while the remaining periods are not explained at all or erroneous. Bossaerts and Hillion (1999) use dividend yield, among many other commonly used predictors such as price-earnings ratio and the stock market's price level, and subject them to several model selection criteria to determine the best in-sample fit for excess stock returns in 14 countries, Sweden and Switzerland included. They find no out-of-sample explanatory power for any of their specifications however, and theorize that it may be due to learning among investors.

Several authors attempt to remedy these observations. Boudoukh, Michaely, Richardson, and Roberts (2007) note that share repurchases have increased as the practice of paying dividends has decreased. They compute a measure of total payouts, combining dividend yield with share repurchases, and find increased explanatory and predictive power of their regressions. They attribute this not to behavioural learning, but rather to changes in the economy, particularly to an SEC (Securities and Exchange Commission) ruling in 1982 that made share repurchases much more common. Kim and Park (2013) agree with Boudoukh et al. (2007) that dividend yield has suffered as a predictive method due to changing payout policies, but disagree with their suggested method of adjustment. They employ method of estimating the long-run relationship between dividend yield and price by computing a ratio between the total dividends paid out by firms with traditional dividend policies, and a theoretical dividend amount if all firms adopted a traditional dividend policy. They arrive at similar and significant conclusions.

The defining factor of most of this research is that it is conducted from a US perspective, particularly that of the data provided by the CRSP (which tracks the NYSE, AMEX and NASDAQ exchanges), which most studies utilize. The research is very sparse for other countries, which partly prompts this paper. Not only are explanations in the SEC policies unlikely to impact Swedish companies' payout policies (at least not directly) but at the time of said ruling noted by Boudoukh et al. Sweden's financial markets were not nearly as developed as today. This paper then seeks to establish whether the dividend yield offers any explanatory power in this time and for this specific market.

3.4 Term Spread

Term spread measures the difference in yield between similar short-term and long-term bonds, most often treasury securities. The exact specification varies between papers: Schwert (1990) uses Aa corporate bonds-1 month treasury bills, Cohen (1999) 10-year treasury bills-1-month treasury bills, while Fama and French (1989) use Aaa corporate bonds- 1 month treasury bills, though they note that substituting for long-term treasury bonds has little effect on the result. Term spread has been observed since the late 1980's to have clear capabilities of predicting future growth beyond that captured by short-term interest rates, suggesting that there is more information conveyed through the term spread than merely the current monetary policy (see (E. F. Fama & French, 1989), (Keim & Stambaugh, 1986), (Campbell, 1987)). There's no set standard for what spread to use, but we follow Cohen (1999).

Fama and French (1989) find that the Term Spread predicts excess returns much like Dividend Yield, but over shorter time horizons. The element of excess returns captured by the term spread suggests that it's similar among securities with similar maturities, indicating an element related to the maturity. They also find a persistent link between term spread as a predictor and future yields on all kinds of equity and bonds, indicating a reflection of inherent risk in different maturities between assets.

The reason for this predictive power is less agreed upon, but there are two main schools of thought on the matter: that the term spread is indeed related to the monetary policy, and the other due to the underlying workings of the economy (albeit still tied to the monetary regime). The first explanation posits that temporary monetary tightening and expansions lead to changes in short-term expectations, but not long-term, or at least smaller changes in long-term expectations, thus leading to the varying term spreads observed (Benati & Goodhart, 2008). This explanation posits that the nominal term spread is a relevant indicator of future economic conditions.

The second explanation maintains that the real term spread is relevant, and is based on the idea of consumption-smoothing: consumers to wish smooth their consumption across good times and bad. A shock will thus cause consumers to loan, increasing the short rate but leaving the long rate unchanged, since the loans are only for the purpose of smoothing over the bad times. This explanation requires that inflation exhibits persistence: if it doesn't, then the term spread can be disturbed by inflationary shocks, such as actions by the central bank.

This will, like a real shock, disturb the short term rates but not long term, thus generating noise. If inflation does exhibit persistence however, then an increase in inflation will translate to increased inflation in the long run as well, leaving an unaffected term spread, but a real shock will not, since its effects on the economy are temporary. Changes in term spread then carry information other than inflation and thus exhibit predictive power (Bordo & Haubrich, 2004).

This relationship is expected to be lessened under credible monetary regimes with inflation targets, such as the Swedish Central Bank, as changes in the short-run rate does not lead to a one-to-one change in long term yields. This causes the nominal yield to distort the underlying real yield curve, lessening the predictive power of the spread. Both of these explanation thus predict that an inflation targeting monetary regime lessens the predictive power of the term spread.

Term spread does not appear to be as widely researched in the literature as dividend yield in relation to the stock and bond markets, and seems to have tapered off since before the shift of the millennium. Still, Welch and Goyal (2008) do test term spread as well in their paper, and find that it lacks, similarly to dividend yield, explanatory power.

3.5 Behavioural Aspects

The academic field of financial economics came to be dominated by the efficient market hypothesis in the 1970s, but its assumptions and conclusions have drawn criticism from an increasing number of economists in the following decades up to this day (Shiller, 2003). The concept that investors are not rational presents the problem that one must know if some but not all investors are rational, if all investors are similarly irrational or if they're irrational in different aspects. Dividing investors into private and institutional categories is a reasonable starting point to alleviate this problem. Not only are they likely to be different due to agency problems, but institutional investors are also likely constrained by various other aspects, such as the matter of legal directives and tax situations they face (Cohen, 1999). A further divide, this between institutional into commercial, further refines this line of reasoning (Drobetz et al., 2009).

Greenwood and Shleifer (2014) look at investor surveys from six different sources, which survey investors' expectations of future market movements, and find that investor expectations are negatively correlated with actual market developments. The interview subjects are fund managers, CFOs and other individuals with "know-how" in the field. Greenwood and Shleifer propose models with incorporate different kinds of investors, one group which extrapolate good performance with continued performance, and one group which accommodates this demand.

3.6 Information Asymmetry

Information is vital for rational decision making, and necessary for optimal investment allocation. However, all information doesn't reach everybody in equal form, and not every investor have the expertise to use the information well. Assuming investor heterogeneity (see section 3.2) between our investor groups, it follows that investors in different investor groups will have either varying access to information, different investment skills, or both. Differences in investment behaviour can be explained by these factors, and result in different investment outcomes for the groups.

The field of foreign investors versus domestic investors have been studied in several cases, but remains controversial. Some authors find that foreign investors are disadvantaged (Hyuk, Bong-Chan, and Stulz (2005) on Korean data, DvoŘÁK (2005) on Indonesian data, Hau (2001) on German data), while others argue that domestic investors are at an advantage (Grinblatt and Keloharju (2000) on Finnish data, Froot and Ramadorai (2001) on comprehensive data on 25 countries). The main reason postulated for foreign investors disadvantage come from inferior access to information on the domestic market, but other explanations such as a bias among regulators for domestic investors and against foreign investors (Hyuk et al., 2005).

An explanation for the advantage of foreign investors comes from the assumption that foreign investors are more global and have a larger investor knowledge and expertise. Which of these explanations hold more weight is as of now uncertain. One can wonder why foreign (domestic) investors doesn't work to eliminate their information disadvantage at domestic (foreign) investments. An explanation put forth by Van Nieuwerburgh and Veldkamp (2009) is that investors want to exploit their advantages rather than become a more well-rounded investor. Therefore foreign investor doesn't put in the effort needed to become equal with domestic investors in handling information in the domestic market.

4. DATA

4.1 Total Financial Holdings

The data on financial holdings is taken from Statistics Sweden (SCB) who reports quarterly data on disaggregated groups based on the European Standards of Accounting of 1995 (ESA 1995). We focus on five investor groups: Private investors, commercial investors, institutional investors, government investors and foreign investors. Together, these groups hold 98% of the total financial assets in Sweden as of the third quarter of 2013 (numbers calculated from data by Statistics Sweden).

Private investors consists of all assets owned by private households, and non-profit organisations as well. Non-profit organisations are included and not accounted for separately due to EU-regulations (ESA 1995). However, they are not expected to significantly alter the result considering private holdings dwarf non-profit organisations. Cohen (1999) also includes non-profits in the private sector, so this feature of the data introduces no real disturbance in the comparison of the papers.

Institutional investors are constituted of several separate forms of investors: banks, insurance companies, other financial companies and social insurance assets (socialförsäkringar), the latter of which comprises government funds dedicated to various social support purposes which are not under the control of their residual claimants, such as pension funds and compensation for sick leave (thus PPM pension funds are not allocated to the social sector). Other financial companies are our closest analogue to bank personal trusts reported in Cohen (1999), social insurances form a weakly comparative analogue to pension funds. While neither is a perfect substitute, they are as close as we've been able to generate from Swedish data. Note that while social insurance assets are on paper are owned by the government, we have chosen to include them in the institutional category. This is because our group divisions aim to predict different investor behaviour, and the directives of the various governmental insurance agencies is more likely to correspond to that of commercial investors, as their goals are to administer their funds and generate growth to savings. Government holdings, on the other hand, are beholden to other demands, such as strategic company ownership shares, or financing various government functions on a daily basis, and thus we report them as a separate group.

Government investors are only comprised of the central government, as the municipal sector has negligible asset holdings in all classes even in the aggregate compared to the rest of the economy. Municipal governments in Sweden furthermore face hard budget constraints, as opposed to the central government, likely leading to different financial behaviour. Commercial companies are companies not explicitly engaged in the financial market, from giants such as Volvo to newly started companies owned by individual entrepreneurs. The group is thus very diverse and hard to profile, yet holds a large portion of the total amount of financial assets, primarily equities. Finally, we report on foreign capital owners. Unlike the US, Sweden is a small open economy and thus has a much more pronounced share of financial assets owned by foreigners, on average 25%. This category rounds out our dependent variable investor classes.

Financial assets are defined as consisting of two groups: EQUITY and BONDS. The holdings are measured at market prices in SEK. EQUITY includes all stock held, listed as well as non-listed, and equity funds, representing about 54% of total financial assets over our sample period. Non-listed equity is valued as total company assets with some minor profit and tax adjustments. BONDS comprises fixed income instruments, including bonds, certificates of deposit, coins, bills and liquid cash holdings in banks. BONDS thus comprise the remaining 46% of financial assets.

The only notable data point not included in these measures are equity and bond holdings in mixed mutual funds. There is no data separating the holdings in these funds, but they comprise less than 2% of all assets included in our analysis, and so we do not expect their exclusion to distort our results much.

The time period in our study stretches from the third quarter of 2001 to the third quarter of 2013, lending us 49 data points. Though this value is lower than one would wish, it does not render any of our statistical methods theoretically unsuited for our analysis, although it does naturally lead to a greater inability to draw significant conclusions from our data.

Earlier data is available, but becomes increasingly spotty very quickly. Prior to 2001, data on mutual fund holdings are not reported for all groups, and prior to 1996, reports of various asset classes become unspecified for several investor groups. We've chosen to exclude the ~20 data points available for the years 1996-2001 in order to perform our analysis on as complete a data set as possible, and to avoid sudden spikes of asset increments due to accounting protocol within our regressions.

4.2 Dependent Variables

Based on our two different asset classes we compute several dependent variables for all quarters *t* which we use for all of our regressions in this paper.

$$EQPORTFOLIO_{j,t} = \frac{EQUITY_{j,t}}{EQUITY_{j,t} + BONDS_{j,t}}$$

The $EQPORTFOLIO_{j,t}$ variable represents how much EQUITY one sector holds compared to the sector's total liquid financial assets at time *t*. A BONDPORTFOLIO dependent variable is extraneous, as it would simply be defined as $BONDPORTFOLIO_{j,t} = 1 - EQPORTFOLIO_{j,t}$. As such, its values in regressions would mirror or reflect those of EQPORTFOLIO.

$$EQMARKET_{j,t} = \frac{EQUITY_{j,t}}{Total\ EQUITY_t}$$

$$BONDMARKET_{j,t} = \frac{BONDS_{j,t}}{Total\ BONDS_t}$$

The $EQMARKET_j$ variable effectively shows how much EQUITY a sector holds compared to all equity in the economy, and $BONDMARKET_j$ is an analogous statistic for bonds.

While individuals and organizations undoubtedly view their own asset holdings from the perspective of how much they've placed in either equities or bonds relative to their own portfolio, they're unlikely to consider their own sectors ownership share of the total market. From an aggregate view point however it may be interesting to investigate, and so we compute market variables as well.

The below table summarizes the relative EQUITY and BOND holdings of our five investor groups in Sweden during the period of third quarter of 2001 to third quarter of 2013.

Table 1. Summary Statistics

	Mean	**Std. dev.**	**Min.**	**Max**
Equity, bond and cash holding relative to investor portfolio holdings				
EQPORTFOLIO				
All Investors	53.54%	3.95%	43.94%	60.90%
Private	55.87%	5.60%	45.34%	67.06%
Institutional	39.89%	4.18%	28.74%	46.44%
Commercial	86.52%	2.83%	74.07%	89.80%
Government	79.96%	3.29%	70.58%	85.89%
Foreign	39.03%	2.80%	30.91%	43.77%
Equity, bond and cash holdings relative to total holdings				
EQMARKET				
Private	11.50%	0.97%	9.80%	14.32%
Institutional	23.61%	1.42%	20.75%	29.13%
Commercial	42.78%	2.35%	34.52%	45.98%
Government	3.03%	0.29%	2.38%	3.77%
Foreign	18.65%	1.51%	16.11%	21.71%
BONDMARKET[1]				
Private	10.42%	0.53%	9.26%	11.43%
Institutional	41.08%	0.80%	38.19%	42.09%
Commercial	7.60%	1.02%	6.24%	12.10%
Government	0.87%	0.14%	0.64%	1.29%
Foreign	33.56%	1.03%	31.57%	35.55%

[1] BONDMARKET doesn't add up to 100% of the market due to the exclusion of the bond holdings of the Swedish Central Bank, mortgage institutions, and housing associations.

Table 2. Dependent Variable Correlations

EQMARKET	**Private**	**Institutional**	**Commercial**	**Foreign**	**Government**
Private	1.00				
Institutional	0.14	1.00			
Commercial	-0.05	-0.88	1.00		
Foreign	-0.64	0.29	-0.60	1.00	
Government	-0.26	0.10	-0.28	0.27	1.00
BONDSMARKET					
Private	1.00				
Institutional	-0.15	1.00			
Commercial	0.28	-0.43	1.00		
Foreign	-0.17	0.07	-0.59	1.00	
Government	0.39	0.06	0.18	-0.26	1.00
EQPORTFOLIO					
Private	1.00				
Institutional	0.85	1.00			
Commercial	0.59	0.27	1.00		
Foreign	0.75	0.92	0.28	1.00	
Government	0.55	0.49	0.25	0.35	1.00

$EQMARKET_p$ shows a large spike in the second quarter of 2002, increasing the nominal value of equity for private investors by 52% in that one quarter before immediately dropping back down again the following quarter. The data reveals that this is because it's the first quarter in which non-listed equity is calculated for private households, and in subsequent quarters private equity holdings overall were decreasing. This pattern does not persist for long, as private equity holdings show a strong increasing trend over the sample period.

$EQMARKET_i$ shows a similar spike. This appears in the first quarter of our sample simply appear to be a normal decline relative to the entire economy.

$EQMARKET_c$ conversely has a noticeable minimum. This is also an aberration in the very first quarter of our sample. This value might suggest an aftermath to the IT-crash of 2000, whereby the aggregate equity worth of the commercial sector was temporarily reduced.

$EQMARKET_g$ appears to be in steady decline, though with considerable variation within the sample. This is a natural result of the Swedish Government continually selling company assets since the 1980's (Munkhammar, 2009).

$BONDMARKET_c$ experiences a sharp decline both in relative and absolute terms in the first two quarters of our sample.

There are furthermore some very interesting data points once compared to the data provided by Cohen and Drobetz et al. for the US and Swiss economies respectively. Cohen (1999) only reports data on $EQPORTFOLIO_j$ for the private and institutional sector, while Drobetz et al. (2009) report on the same variables, but only have private, commercial and institutional investor types included in their analysis.

We find that 55.87% or private investor assets are equities in Sweden, while Drobetz et al. report a similar number of 59.78% for Switzerland. But Cohen reports that only 28.3% of US private assets are held in equities.

Closer examination of the data sets reveals that this discrepancy is not due to different investor behaviour across the Atlantic. Cohen's data source, the Financial Accounts of the United States (previously called the Flow of Funds Accounts of the United States) published by the Federal Reserve Board of Governors, includes a detailed breakdown of how private equity is managed. Equities owned by private investors, but managed by managers, are thus presented distinct. This allows Cohen to better model the behaviour of different investors. If one sums all equity held by American private investors, the numbers are roughly similar to those of us and Drobetz et al. We have been unable to find such fine-grained data for our purposes, and we discuss the effects this has on our analysis in section 6.2.

Another anomaly is the fraction of equities commercial companies possess in Sweden. $EQMARKET_c$ is 42.78% in Sweden, more than three times larger than reported for commercial companies in Drobetz et al.(2009). We are unsure of what gives rise to this discrepancy, though we suspect it's a data feature.

4.3 Explanatory Variables

As explained in section 3, we regress our dependent variables primarily on both dividend yield and term spread. The dividend yield we've taken from the Thomson Reuters Datastream, and is computed on the OMX30. While this does not represent the entire stock market, a more detailed measure could not be acquired. We consider it a proxy for the dividend yield of the entire stock market. The dividend yield is calculated by the difference of log dividends and log of lagged prices. The term spread we computed as the difference between the return on 10-year Swedish treasury bonds and 1-month Swedish treasury bills. Both interest rate measures were obtained from the Swedish Central Bank (Sveriges Riksbank).

To account for other economic effects outside of the explanatory power of dividend yield and term spread, we include three other independent variables in our regression analysis. The first is simply GDP growth, the second changes in inflation and the third changes in the TCW-index. The TCW-index is an index of a basket of currencies weighed and measured against the SEK, to provide a rough measure of the exchange rate towards Sweden's main trading partners. We will use this as a substitute for an exchange rate towards the rest of the world, and is mainly of interest as Sweden is a small economy normally though to be dependent on favourable exchange rates towards the rest of the world to support our export industry, which comprises around 50% of GDP according to Statistics Sweden.

GDP growth and changes in inflation are included to make sure dividend yield and term spread offer explanatory power of their own. Inflation were substituted for KPI, the equivalent to the CPI in the US. GDP growth, KPI and the TCW-index, all reported on a quarterly basis, were collected from Statistics Sweden.

All of our depended variables are lagged one period in the regressions, since economic actors cannot act on information when generated, but when it has been observed and disseminated through the economy. This follows the methodology of both Cohen (1999) and Drobetz et al. (2009).

Lastly, in order to avoid wrongly specified regressions causing inaccurate results, we test for multicollinearity among the explanatory variables. Multicollinearity exists when the explanatory variables in a model are highly correlated with each other. An example of this could be if you included unemployment rate as one variable and total unemployment compensation as another variable in a model, two variables reasonably highly correlated. The model as a whole would be relatively unaffected and give a correct regression results, however the coefficient and significance of the individual variables would be skewed, as the regression would not identify which variable contributes to changes in the dependent variable. The unemployment compensation rate would seem to significantly affect the model, even if it's more reasonable to assume that the unemployment rate is causing both the total unemployment compensation and dependent variable to increase/decrease. Considering that the significance on individual variables, such as dividend yield and term spread, is the reason we perform our regressions, this is a potential problem necessary to investigate. Performing a Variance Inflation Factor test results in a clear indication of no multicollinearity, with values much lower than the suggested cut-off value described by Carney and Surles (2002).

4.4 Data Limitations

Our analysis exclusively uses aggregate data, which severely limits the conclusions one can draw. Furthermore, while Statistics Sweden provides very detailed information in a host of areas, the financial information we have accesses is lacking for much of the last few decades. Much of this is undoubtedly due to changed variables being tracked after the Swedish Financial Crisis in 1992, and furthermore with Swedish membership of the EU in 1995. Thus better data will hopefully be acquired with time.

The aggregate nature of the data furthermore lends itself particularly bad for our analysis intentions, as we are most interested in whoever handling a specific asset, not necessarily who owns it. This is mostly a problem for our private investor category, which incorporates an unknown amount of assets which financial advisors are managing. The other categories are mostly distinct. Foreign investors are most likely institutional investors from other countries, but their different home markets lead us to suspect that they do invest dependant on different restrictions than Swedish institutional firms.

5. METHODOLOGY

5.1 Time Series Properties

In order to apply our OLS-estimation models to our data and receive correct results, we must make sure the data conforms to the criterion necessary for OLS to apply. As we will discuss in section 5.2, Autocorrelation will be integral to understanding our time series. However, in order for us to draw relevant conclusions about any autocorrelation in our series we need first to determine whether our time series are stationary or not. For that, we need to perform unit root analysis.

A unit root can be understood by looking at the following very general autoregressive formula:

$$Y_t = A + B * Y_{t-1} + C * t + \varepsilon$$

where A and B are constants, $C * t$ is a trend term and ε is an error term assumed to be white noise. This is an AR(1) equation, and the amount that Y_t depends on the previous period depends crucially on the value of B. If B is equal to zero then the series exhibits no autocorrelation and every value the series takes is completely independent of any other. If B is equal to one then the equation is a random walk: the movement is entirely due to white noise and there's no force moving it towards any mean value, it is thus not stationary. If this is the case, the series exhibits what is called a unit root, and OLS-estimation for time series does not apply.

If $B < 1$ however, the series is stationary around value A. Any change in the series by an errant ε term will eventually dissipate as we move further and further away from time t, thus causing the function to shift back toward the mean A. Thus we test whether our time series appear to be stationary or not.

A time series can also be stationary around a trend $C * t$. If $B < 1$ it will keep reverting back to this general trend, thus being what is called trend stationary.

We will utilize two tests to check for unit roots: the augmented Dickey-Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS). The former tests the null hypothesis that a time series has a unit root, while the latter tests the null hypothesis that a time series is stationary. Thus we are given two opportunities to evaluate our time series.

Both tests require us to specify whether to test for an intercept and trend and to determine appropriate lag. How to determine this will in large part depend on intuition and what is reasonable, as per Hamilton (1994, p. 501).

Intercept should be included in the analysis if we think the series is likely to have an intercept. This is generally true for all our series, as it would be very strange to assume any investor group would have as their default position a portfolio with no stocks or bonds in it. This also holds for our independent variables in general, but will merit further discussion in section 6.1.

Trend is more complicated to determine. While it's unlikely that any of our series naturally exhibit a trend in the long run, as they are all mostly quotas of one kind of another, our sample data is of a relatively short window in time and may well exhibit a trend. Thus we will graphically analyse our time series to determine whether to test for a trend as well.

5.2 Autocorrelation

The concept of autocorrelation is a recurring feature of economic analysis utilizing time-series data, and a crucial point in both of our analyses. We therefore briefly explore the general concept before specifying our analysis models.

Autocorrelation can be understood as described by E. F. Fama (1991, p. 1582):

"An autocorrelation is the slope in a regression of the current return on a past return."

A time-series can thus exhibit varying levels of autocorrelation. A value of 1 indicates perfect autocorrelation, present values depend only on past values, while 0 indicates no autocorrelation, meaning present values do not depend on past values at all. To determine the nature of our time series, we study our time series by way of what is commonly called the Box-Jenkins methodology, outlined in Box, Jenkins, and Reinsel (2008).

Box, et al. outline the methodology as a first step in the process of selecting a proper ARMA model specification, however we opt to use a linear specification in line with previous research. We still utilize the process to give us an idea of the nature of the autocorrelation within the data, both to compare the results to the OLS-estimation and in particular for the VAR-analysis.

The two tools are the autocorrelation and partial autocorrelation functions. The autocorrelation function (ACF) describes to which extent a present value of a variable depends on all previous values of the same variable. The partial autocorrelation function (PACF) describes how a function value at present depends on only the most recent previous value, accounting for any earlier dependencies. The nature of these two functions can reveal the nature of a time series.

Utilizing these two functions assumes that the underlying time-series is stationary. This is the reason we devoted the previous section to analysing our time series to determine whether these two functions apply. However, the ACF can still provide an informal useful insight here. If it appears decaying, but very slowly, this is indicative of a non-stationary series, as any change in the time series will appear as an autocorrelated relationship, when the function is in fact moving due to an unobserved shock. We will utilize this aspect when analysing our time series. Box et al. (2008, p. 32) suggest that 50 observations are necessary for a dependable autocorrelation estimation, which is approximately our sample.

5.3 OLS-estimation

Following the work of Cohen (1999) and Drobetz et al. (2009), we perform a series of regressions on our computed dependent variables. The regression used is a standard OLS-specification, using the dividend yield and term spread as our main explanatory variables and GDP growth, unexpected inflation and the TCW index as potential explanatory variables in the following form:

$$\mathrm{Y} = \mathrm{c} + \beta_1 * \mathrm{Dividend\_Yield} + \beta_2 * \mathrm{Term\_Spread} + \beta_3 * \mathrm{GDP\_Growth} + \beta_4 * \mathrm{Unexpected\_Inflation} + \beta_5 * \mathrm{TCW\_Index} + \varepsilon$$

Where Y indicates one of the dependent variables from section 4.2, either equities/bonds as a total of all equities/bonds, or as a ratio of the equities/bonds of the select group's liquid financial assets.

The simple nature of the regression may initially seem inappropriate for the time-series data we are using, and indeed an initial regression reveals extremely low values for the Durbin-Watson statistic (DW-statistic), indicating high autocorrelation in the residuals (J. Durbin & Watson, 1950). At the 5% significance level, a DW-statistic of 1.34 or lower with five independent variables indicates positively correlated error terms (J Durbin & Watson, 1951). Since our initial regressions continually return DW-statistics of well below 1.0, generally in the neighbourhood of 0.3-0.8, this is highly indicative of autocorrelation.

The original paper by Durbin and Watson does not explicitly state how to remedy such a problem, but the field has invented many ways to work around the problem of autocorrelation, a recurring issue when working with time-series data. We have taken measures to try and better model the data.

Our solution of choice, presented in this section, is to follow the models of Cohen (1999) and Drobetz et al. (2009), which use adjusted Newey-West standard errors as well as bootstrapped standard errors to adjust for the autocorrelation errors. Under the assumption of autocorrelation standard OLS estimation is still unbiased, though no longer efficient. Newey-West attempts to alleviate this problem by adjusting the standard errors to account for the autocorrelation inherent in the sample (Newey & West, 1987). The Newey-West standard errors generally provide larger standard errors, and in our case this has been so.

Generating Newey-West standard errors introduces a judgment into the data set, as we have to specify how many lags it takes before any autocorrelation effect dies out in order to generate the standard errors. Though this is a judgment call we have attempted to choose this lag with care. Normally, especially when working with quarterly data as we are, one would generally assume that four lags would be appropriate, to account for any seasonality in the data set. The Partial Autocorrelation Functions for several of our time series reveals however that most of the autocorrelation dissipates after just one period, so we have generated Newey-West standard errors with one lag. This seems reasonable to assume; while seasonality is often observed in economic time-series, whether because of varying market demand or results of other behavioural effects due to weather, temperature or some other variable that varies by season, it seems unlikely that the decision of whether to invest in stocks or bonds would vary with the seasons.

Bootstrapping is another method by which various types of information can be resampled. Bootstrapping works by sampling with replacement from our sample of the population (in our case, our 49 observations of the many different states asset distribution in Sweden has been divided between q3 2001 and q3 2013). Assuming that the values of a sample have themselves been selected at random from the population at large, a continuous resampling of the original sample in different combinations should, in the end, generate standard errors that would correspond to the population as a whole. For our use, we perform bootstrapping to generate new standard errors based on 10.000 bootstrapped samples rather than our one sample of 49. We perform residual bootstrapping, whereby the residuals of our fitted model are randomly paired with our independent variables. Our results generally appear close to the Newey-West standard errors, and do not lead to significantly different conclusions. However, there are many mathematical methods of bootstrapping in existence and for time series a standard residual bootstrap such as this is not preferred due to the possibility of error terms exhibiting autocorrelation. Since the two previous papers in the field, Cohen (1999) and Drobetz et al. (2009), primarily present Newey-West standard errors, we feel it is beyond the scope of this paper to further study the bootstrap methodology. As such, we have chosen not to analyse this aspect further.

5.4 Vector Autoregression Analysis to Estimate Lead-Follow Relationships

An interesting aspect to examine is the structural relationships between Institutional-, Commercial-, Private-, and Foreign investor groups. Government is excluded as an investor group, due to a lack a theoretical basis for a relationship with the other groups. By examining these relationships we can see which group acts first on market information, and draw conclusions on the investor groups' relative rationality and activity, and whether investor groups influence each other. The analysis performed is modelled on Drobetz et al. (2009), where a statistical method called Vector Autoregression is used. The variable chosen to investigate is the share of equity regarding the group's own portfolio of investments, as we then can compare and contrast the result with Drobetz et al.

Due to the aggregated nature of our data, we cannot separate deliberate asset allocation changes through trading between different investor groups from price changes. However, by using a Vector Autoregression (VAR) analysis we can estimate the lead-follow relationships to give an indication to which investor group acts first and which follows. Performing the analysis, we can capture significant relationships between each of the four groups and each other, not affected by price effects due to the systematic dynamic nature of VAR (Drobetz et al., 2009) .

The use of Vector Autoregression is well suited for investigating relationships of several autocorrelated macroeconomic variables, such as different investor groups' share of equity, due to its design to capture interdependencies among multiple time series. Another major advantage is the lack of required information of the underlying forces influencing the variables, as only the variables influence on each other is calculated (Sims, 1980). As such, while certainly related to examining the actions of different investor groups, this Vector Autoregression analysis in no way depend on the previous OLS-regressions. The result will show how investor groups follow and influence each other, and to what extent.

For the analysis we use the $EQPORTFOLIO_j$-variable, the share of equity the different groups possess relative to their own total holdings. In order to perform a correctly specified VAR-regression, first we must see if the variables are stationary or non-stationary. Since our variables are strongly autocorrelated we suspect they may have a unit root, which would indicate non-stationary variables and forcing us to adjust our VAR-regression. Testing, using an Augmented Dickey-Fuller (ADF) test as per Drobetz et al. (2009), results in that a null hypothesis of a unit root can't be rejected for two of the investor groups. This mixed result mean that we must view the regression as non-stationary (See Appendix 3 for details).

Now that the regression is concluded to be non-stationary, we must test if the variables are cointegrated. We conduct a Johansen Trace Test Statistic to estimate the number of cointegration relationships between the four investor groups, as without a cointegration relationship any VAR-analysis would not be meaningful, and with several cointegration relationships the results become very difficult to interpret (Johansen, 1991). Test results lead us to reject the null hypothesis of no cointegration relationship at 1% significance level, and to conclude that there exists only one cointegrating relationship (See Appendix 2 for details).

To account for a unit root, we need include an error correction term in the VAR-analysis. This leads us to use a Vector Error Correction (VEC) specification of the VAR-analysis. Our VEC analysis is performed with one lag, which is appropriate according to the Schwarz information criterion as well. As a result of previous tests we are ready to specify our VAR-analysis, and perform a one-lagged VEC regression with one cointegration equation.

6. EMPERICAL FINDINGS AND DISCUSSION

6.1 Time Series Analysis

Before testing for unit roots, we need to determine whether to test for an intercept, and intercept/trend or neither. The diagrams forming the basis of our assumptions are reported in Appendix 1: Time Series Diagrams. We find that $EQMARKET_G$, and $BONDMARKET_C$ exhibit a negative trend, F_BONDMARKET and DIVIDEND_YIELD a positive trend, while all other series are trendless. Furthermore, TCW_INDEX does not appear to require an intercept term as it hovers around 0.

Table 3

EQMARKET	**ADF**	**KPSS**
Private	0.0359**	*
Institutional	0.0006***	*
Commercial	0.0046***	-
Foreign	0.3525	*
Government	0.2040	-
BONDMARKET		
Private	0.2416	-
Institutional	0.0065***	-
Commercial	0.0000***	**
Foreign	0.0000***	-
Government	0.1535	*
EQPORTFOLIO		
Private	0.1219	-
Institutional	0.0382**	-
Commercial	0.0000***	-
Foreign	0.2172	-
Government	0.0011***	-
INDEPENDENT VARIABLES		
DIVIDEND_YIELD	0.0869*	-
TERM_SPREAD	0.0462**	-
UNEXPECTED_GROWTH	0.0000***	-
UNEXPECTED_INFLATION	0.0000***	*
TCW_INDEX	0.0002***	-

* 10%, ** 5%, *** 1% (KPSS does not follow a normal t-distribution and does not generate an easily comparable p-value, thus we only signify significance in the table)

Some of these results are truly puzzling. The ADF, if significant, indicates that there is no unit root and the series is stationary, while significant KPSS results indicates the opposite. Thus there are several discrepancies, in $EQMARKET_p$, $EQMARKET_i$, $BONDMARKET_c$ and UNEXPECTED_INFLATION, where both tests return positives, something that should ideally not happen.

A caveat is that the ADF is a statistically weak test (Elder & Kennedy, 2001). It is thus likely to return false positives, so we might take barely significant results with a grain of salt. For this reason, there is reason to adhere to the KPSS results over the ADF results. However, for $EQMARKET_i$ and UNEXPECTED_INFLATION the ADF significance is much larger, and so it's not entirely clear which result to adhere to.

$EQMARKET_f$ and $BONDMARKET_g$ only reveal positive results for a unit root, casting serious doubt over the proposition of drawing relevant results from any eventual analysis results based on them. All other variables reveal either indications that they are stationary or inconclusive results.

We study the ACF and PACF plots of the uncertain time series to see whether there's anything they can tell us. A brief glimpse of $BONDMARKET_c$ and UNEXPECTED_INFLATION, pictures in Figure 1 and Figure 2 respectively, reveal that the former is clearly showing signs of a unit root due to the characteristic slow decay, while the latter appears quite random. The numbering 1-20 indicates lag length.

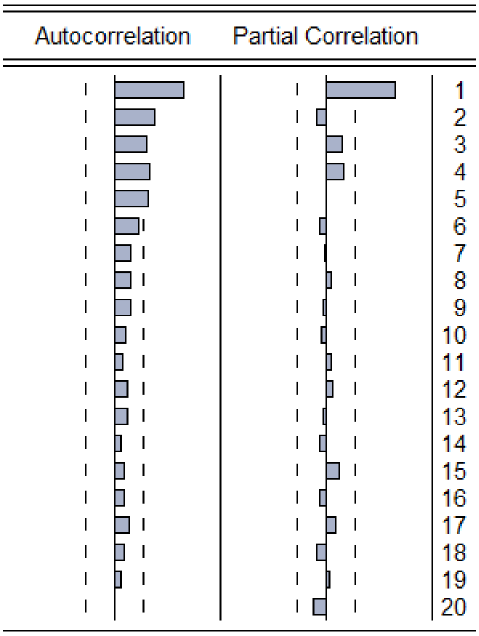

Figure 1: $BONDMARKET_c$ ACF and PACF

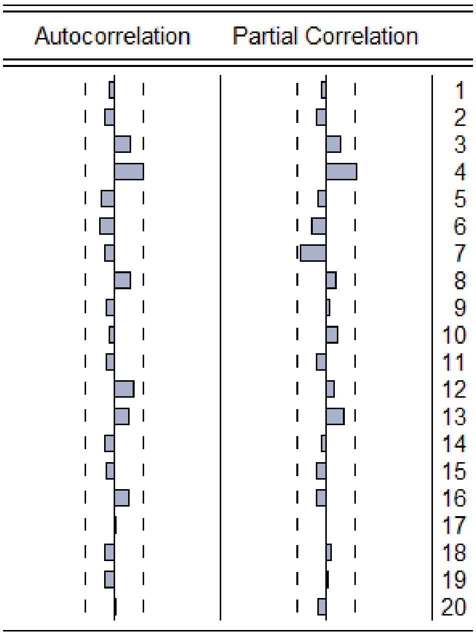

Figure 2: UNEXPECTED_INFLATION ACF and PACF

Closer inspection of our other variables with questionable results reveal no clear unit root patterns. With the exception of $BONDMARKET_g$, which appears random as in Figure 2 above, all display varying patterns of autocorrelation.

Due to the nature for the paper and our approach of verifying earlier research, we will still analyse all variables and address any unit root issues in their separate sections. Importantly however, all our independent variables appear to be stationary, without which the entire analysis would have been difficult to perform.

6.2 OLS-Estimation

The results from our OLS-analysis are inconclusive. We've regressed 15 different variables dependent on DIVIDEND_YIELD, TERM_SPREAD, UNEXPECTED_GROWTH, UNEXPECTED_INFATION and TCW_INDEX. The last three explanatory variables are occasionally significant, but their impact is always extremely small, with coefficients that never exceed $1 * 10^{-2}$, often much lower than that. The interpretation, since this is a standard linear specification, is that any given change in our three extra explanatory variables leads to corresponding changes in our dependent variables less than 1/100 the corresponding size. As such, even when significant and assuming the fitted relationship is a true representation of the actual data, their effect on investment behaviour is so small as to be negligible. Given the number of regressions we perform and the small coefficients it's likely that the statistically significant values, when they do appear, represent a false positive (Nuzzo, 2014). This relieves us of the problem of UNEXPETED_INFLATION potentially exhibiting a unit root, as discovered in section 6.1. Since the impact is consistently small and negligible this will not affect our analysis further.

Dividend Yield and Term Spread provide a somewhat different result, and we've summarized the tests below. A full specification of our regressions can be found in Appendix 2: OLS Results. Before we continue into detail regarding our regression results, it's worthwhile to remember why we've used dividend yield and term spread as our independent variables. They're acting as proxies for business conditions, i.e. business cycles. Dividend yield over longer horizons, term spread over shorter (1 year or less). This will inform much of our discussion in this section.

Table 4. Regression Results

BONDMARKET	**Variable**	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
P	DIVIDEND_YIELD	-0.292913	0.139310	**-2.102600***	0.0414
R^2=0.35	TERM_SPREAD	-0.387194	0.079720	**-4.856902*****	0.0000
I	DIVIDEND_YIELD	0.068512	0.230142	0.297694	0.7674
R^2=-0.03	TERM_SPREAD	0.113870	0.191541	0.594493	0.5553
C	DIVIDEND_YIELD	-1.130460	0.120155	**-9.408315*****	0.0000
R^2=0.53	TERM_SPREAD	-0.393091	0.105858	**-3.713373*****	0.0006
F	DIVIDEND_YIELD	0.757078	0.273136	**2.771794****	0.0082
R^2=0.43	TERM_SPREAD	-0.167991	0.261767	-0.641757	0.5244
G	DIVIDEND_YIELD	-0.051807	0.036316	-1.426564	0.1609
R^2=0.05	TERM_SPREAD	-0.053631	0.027348	-1.961082	0.0564
EQMARKET					
P	DIVIDEND_YIELD	-0.732440	0.181309	**-4.039724*****	0.0002
R^2=0.31	TERM_SPREAD	-0.041954	0.199063	-0.210756	0.8341
I	DIVIDEND_YIELD	-1.149545	0.531162	**-2.164207***	0.0360
R^2=0.25	TERM_SPREAD	-0.726581	0.234909	**-3.093035****	0.0035
C	DIVIDEND_YIELD	1.394924	1.996880	0.698552	0.4886
R^2=0.11	TERM_SPREAD	1.168448	0.483279	**2.417753***	0.0199
F	DIVIDEND_YIELD	0.669036	0.634941	1.053699	0.2979
R^2=0.22	TERM_SPREAD	-0.326729	0.231359	-1.412218	0.1651
G	DIVIDEND_YIELD	-0.091907	0.133193	-0.690025	0.4939
R^2=0.02	TERM_SPREAD	-0.034043	0.095474	-0.356565	0.7232
EQPORTFOLIO					
P	DIVIDEND_YIELD	-2.806488	1.780857	-1.575920	0.1224
R^2=0.24	TERM_SPREAD	0.694186	1.280638	0.542062	0.5906
I	DIVIDEND_YIELD	-3.045673	2.110058	-1.443408	0.1562
R^2=0.23	TERM_SPREAD	-0.997515	1.387394	-0.718985	0.4760
C	DIVIDEND_YIELD	1.439854	0.764511	1.883366	0.0664
R^2=0.06	TERM_SPREAD	0.942376	0.771939	1.220792	0.2288
F	DIVIDEND_YIELD	-1.562644	1.274097	-1.226472	0.2267
R^2=0.24	TERM_SPREAD	-0.492835	0.604252	-0.815611	0.4192
G	DIVIDEND_YIELD	-0.788233	1.164033	-0.677157	0.5019
R^2=-0.01	TERM_SPREAD	0.739380	0.899351	0.822127	0.4155

Different investors groups reveal varying results. For Private investors, we see significant negative results for term spread on the bond market, and dividend yield on the equity market. The straight-up implication of this result, if true, would be that the Private bond and equity holdings increase as dividend yield decreases, which is the incorrect decision to make provided that dividend yield and term spread are high when business conditions are bad. Private investors would essentially be buying high and selling low.

This may appear to be a straightforward result: private investors are among laymen considered to be irrational investors, and the concept of buying high and selling low is well known, but for our particular data set it makes little sense. The category Private Investors gathered by Statistics Sweden, which we utilize in our paper, do not separate holdings based on who administers the assets, but on ownership. Privately hired fund managers and their actions thus show up in our data sample under the heading Private Investors, leading to a muddying of the data. Perhaps their influence is not large enough to offset excessive irrational behaviour on part of private investors, or perhaps managers provide advice that is less than optimal ("Will invest for food," 2014), but the theoretical problems should be kept in mind when considering our results in regard to private investors. Furthermore, the private sector consistently give insufficient unit root analysis results, as $EQMARKET_P$, $BONDMARKET_p$ and $EQPORTFOLIO_p$ all fail to provide clear-cut significance.

The remaining results of our regressions are more difficult to interpret. If we consider Institutional investors, we see that their bond holdings are not significantly related to dividend yield and term spread, while their equity holdings are just as irrational as those of private investors. This would indicate that even institutional investors buy high and sell low, a proposition that seems very strange to assert. Their bond holdings do tend towards rational behaviour, but the result is not significant and the null hypothesis that dividend yield and term spread do not predict investor behaviour cannot be rejected.

Similarly strange results arise in the commercial sector. The sector is, as noted in section 4.1, highly heterogeneous and a catch-all for any company that doesn't primarily deal in financial services, however it is the only sector to appear to act rationally in maintaining its stock holdings. This appears very counter-intuitive, since one would assume a large part of equity held by companies would be subsidiary ownership or otherwise ownership not pertaining to active stock management. Baker and Wurgler (2000), looking at US data between 1927 and 1996, find that firms typically issue larger amounts of equity near business peaks. They do not reconcile this with the EMH, and Greenwood and Shleifer (2014) argue that commercial actors are the rational counterweights in an otherwise irrational market. If someone is selling irrationally, then someone must be on the other end, buying rationally. Companies issuing new equity at business peaks thus could fill this role, and our data would support this hypothesis.

In bonds however, the commercial sector exhibits irrational behaviour to an extreme degree of certainty. Closer inspection of the elements combining to form the BONDSMARKET variable reveals that one average, 73% of commercial holdings are cash reserves. In the case of commercial companies, this is likely not primarily be used for capital gains, but in order to run a business and meet day-to-day operations. To test whether these cash reserves give rise to the anomaly, we perform a regression on $BONDSMARKET_C$ with all cash holdings and transferable deposits removed, but this still generates t-values of -5.51 for dividend yield and -2.25 for term spread, with an adjusted R-value of 0.39. The result is thus not an anomaly due to commercial cash usage practices. We have no credible explanation for this result, however it is telling that this anomaly arises for $BONDMARKET_C$, the variable which exhibits strong results both in favour of a unit root and no unit root. We suspect this may be underlying our strange result.

The Foreign investor results are more reasonable. They do show positive result, albeit only for bonds. The only clear result in these two categories are the results for government, which exhibits no relation between dividend yield, term spread and either their bond or equity holdings. This is not surprising, as we do not expect government holdings to be actively traded in response to business conditions.

All in all, the results do not offer a very clear picture. Why would term spread only affect the bond holdings of Private while dividend yield affects both bond and equity holdings? The same reasoning can be extended to commercial equity holdings and foreign asset ownership. It doesn't paint a very definitive or clear picture, and certainly doesn't lend itself to a neat theory.

Studying the EQPORTFOLIO regressions, we find no significance for any variables, and with the exception of the effect dividend yield has on commercial portfolios, no significance either comes close. Dividend yield and term spread appear to have no relevance whatsoever. Unfortunately, our EQPORTFOLIO variables are the only ones for which we feel confident in asserting that no unit roots exist.

This highlights a problem with our two MARKET variables: they only represent market value. Thus an increase can either be the result of trading, or simple value appreciation of already held assets. Our EQPORTFOLIO variable attempts to remedy this somewhat by considering the comparative holdings of equity to bonds each sector possesses at any given time, under the assumption that investors, following a change in asset valuation, will want to rebalance their portfolios. If all investors, or a large enough number of them, do this there should be a noticeable effect in the aggregate. But our results do not reveal such an effect.

At this point it becomes relevant to study the results of our two blueprint studies, Cohen (1999) and Drobetz et al. (2009). We will quickly summarize each in turn and contrast their findings with ours, each in turn.

Cohen (1999) only presents results for EQPORTFOLIO (called STK%). His regressions, presented in table II in his paper, reveal strong significance for private households, individual strong significance for various institutions, but no collective significance for the institutional sector as a whole. Dividend Yield is consistently significant, with term spread much less so. His conclusions based on this result is that private investors act irrationally, invest at the wrong time, and institutions, being the remainder of the market, buy and sell what is demanded by the private market. In a follow-up paper, Cohen et al. (2002) furthermore find this discrepancy to be exploited by institutional investors to a degree.

Drobetz et al. (2009) utilize BONDMARKET (called FRACBOND in their paper), EQMARKET (FRACEQ) and EQPORTFOLIO (EQUSH) in their paper based on private, institutional and commercial investors. Their results stand in contrast to our own: their EQMARKET results find private and commercial investors to behave irrationally, with institutional investors benefitting, with identical results for BONDMARKET. While the BONDMARKET results mirror our own, the EQMARKET results flip the roles of commercial and institutional in our results.

The final variable, EQPORTFOLIO, they find to indicate irrational behaviour on part of all three investors groups. This is perhaps one of the most striking differences between our papers. We have, in our paper, tried to adhere very close to both Cohen and Drobetz et al. in data set, variable specification and model selection, yet arrive at either differing or inconclusive results. The only really conclusive result that comes through all three papers is that private investors do not manage their holdings of bonds and stocks optimally.

What do we make of these results? What is the apparent reason for our negative results? We believe a possible culprit is the financial crisis. Below, in Figure 3: Plot of Dividend Yield and Term Spread 1995-2013, we've plotted dividend yield and term spread against one another for our sample period. Notice the very large movements that appear in the beginning of 2007, which simultaneously appear to be very strongly negatively correlated. Before this period however, there's very little resemblance in their movements, which appear more erratic. Studying their correlations for these periods reveals this to be remarkably true. For the period 1995-2006, the correlation between term spread and dividend yield is very low at 2.20%. For the period 2007-2013 however, it jumps to -29.91%, a marked increase.

This is an important point if one considers what term spread and dividend yield were said to measure. As pointed out by Fama and French (1989, p. 24), the term spread is more closely related to shorter business cycles. They thus appear to track different aspects of business cycles. If that connection is broken, then their ability to predict the stock market may be undone.

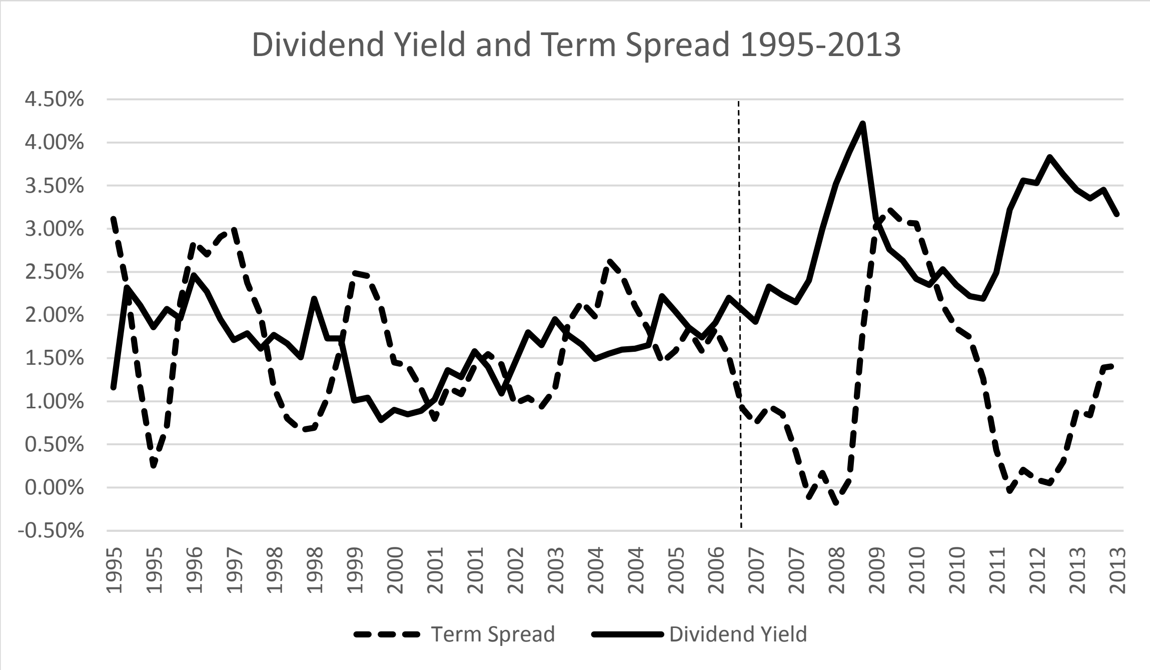

Figure 3: Plot of Dividend Yield and Term Spread 1995-2013

This may not be relevant. As outlined in section 3.4, the term spread appears to have less predictive power in an economy with an inflation-targeting Central Bank. As such, the term spread may be irrelevant, the large term spread fluctuations during the financial crisis simply effects of a Central Bank working hard to maintain its inflation target, and the regression results for the term spread (P_BONDMARKET, C_BONDMARKET, I_EQMARKET and C_EQMARKET) may be spurious. This is worthwhile to mention since neither the Federal Reserve nor the Swiss Central Bank are strict inflation-targeting central banks. Both have inflation targeting as a goal, but unlike the Swedish Central Bank it is not their sole goal. Still, such an explanation needs to consider the dividend yield. What can explain its lack of explanatory power?

There is the issue of data-dredging. Asset price predictability through the application information contained in measures of dividend yield and term spread would violate the semi-strong form of the EMH, as this data is by no means hard to come by. The field has been extensively studied since Fama first reviewed it in 1970 (E. F. Fama, 1991), and the financial data as well has been used in many research papers. This would be mostly relevant to Cohen's (1999) study, as it uses CRSP data, widely used in many American papers. Drobetz et al. (2009) is likely not at extensive risk of this, nor is our paper, but the implication that dividend yield possesses explanatory power should, in a rational market, have been exploited since its discovery, either voiding it of its relevance or, if it is an integral point of how the market works, still show up. The studies outlined in section 3.3 thus indicate that perhaps those results are spurious.

6.3 Lead-Follow Relationships

The result of the VEC regression analysis show that there is only one significant relationship, for foreign investors with private and commercial investors, and no relationship among the other groups. Foreign investors seems to act in similarity with private and commercial investors, only lagged one period. This relationship could imply that foreign investors have an inferior access to information compared to domestic investors. The dynamics and plausibility of this will be discussed in this chapter. Also discussed is the non-relationship between the other investor groups, and the implications thereof. Since the regression model is based on Drobetz et al. (2009) we will compare our result with theirs. Lastly, one must be vigilant and check the validity of the VEC regression result. As such, we use the residual correlation matrix as a method to examine to validity of the result.

Table 5

	$EQPORTFOLIO_{Priv,t}$		$EQPORTFOLIO_{Inst,t}$		$EQPORTFOLIO_{Comm,t}$		$EQPORTFOLIO_{Fore,t}$	
	Coefficient	**T-value**	**Coefficient**	**T-value**	**Coefficient**	**T-Value**	**Coefficient**	**T-value**
Cointegration equation	-0.103215	-1.61724	0.032924	0.77088	-0.070790	-2.88538	0.005553	0.16408
$EQPORTFOLIO_{Priv,t-1}$	-0.148663	-0.43139	0.160773	0.69715	0.003132	0.02364	0.135054	0.73902
$EQPORTFOLIO_{Comm,t-1}$	-0.370381	-0.60650	-0.473735	-1.15921	-0.098304	-0.41874	-0.573311	-1.77032
$EQPORTFOLIO_{Inst,t-1}$	0.242517	0.54968	-0.030733	-0.10409	-0.056769	-0.33472	0.276645	1.18242
$EQPORTFOLIO_{Fore,t-1}$	**0.892355***	**2.16547**	0.440859	1.59868	**0.399453***	**2.52162**	-0.142275	-0.65106
adjusted R^2	0.099751		0.134761		0.171935		0.054433	
T-VALUE FOR TWO TAILED 5% SIGNIFICANCE LEVEL AND 48 D.F IS +/- 2.01063476	*Values bolded are significant at 5% level							

Table 6

Residual Correlation Matrix	$EQPORTFOLIO_{Priv}$	$EQPORTFOLIO_{Inst}$	$EQPORTFOLIO_{Comm}$	$EQPORTFOLIO_{Fore}$
$EQPORTFOLIO_{Priv}$	1.000000			
$EQPORTFOLIO_{Inst}$	0.903599	1.000000		
$EQPORTFOLIO_{Comm}$	0.827966	0.758605	1.000000	
$EQPORTFOLIO_{Fore}$	0.701885	0.787346	0.482784	1.000000

As seen in Table 5 foreign investors lagged one period, in our case one quarter of a year, follow private and commercial investors but not institutional investors. A home advantage where domestic investors have access to superior information would explain the follow relationship of foreign investors for private and commercial investors. However, if that holds, it is strange that foreign investors do not follow institutional investors. Considering that institutional investor group consists of banks, insurance companies and other financial corporations, reasonably the best informed group of them all, this is the group foreign investors should follow. By this reason, we are hesitant to draw strong conclusions from our result. Drobetz et al. (2009) have excluded foreign investors in their Swiss data, and we can therefore not compare our result directly.

In contrast to Drobetz et al. (2009) we find no significant relationship between private and commercial investors. Drobetz et al. results find that commercial investors lead, and private investors follow, albeit in a slow fashion. They hypothesize that there exists an information asymmetry where commercial investors are better informed or better trained than private investors, and therefore react faster and better when new information is spreading through the market. We find no such connection on our Swedish data, and can draw no such conclusions. Swedish private investors may be more on the same level as Swedish commercial investors, such that no information asymmetry exists.

A caveat must be said for the nature of our data. The group of private investors has leakage in the data in form of only ownership of equity is counted, not control. A plausible explanation for both our results and Drobetz et al. to hold simultaneously is that our Swedish data of private investors include to a larger extent equity held by private investors, which they in turn have given to financial advisors to control in order to improve their investment yield. Financial advisors are part of the institutional financial sector, and can be assumed acting as they are in the institutional group.

Data leakage aside, they are more technical reasons for caution when performing a VEC-regression analysis. By examining the residuals of the VEC-regression analysis, and check the correlations between the analysed groups, one would ideally see low correlation for a solid result. If the residuals are highly correlated, this could mean that the regression is biased and the results are not trustworthy. In Table 6 we see that while the residual correlations are lower for the significant result of foreign investors following private and commercial investors, they are still relatively high. Not high enough to conclusively distrust the result, but still enough to be careful of the result.

7. CONCLUSION

Our results are difficult to give a general interpretation. In regards to asset holdings, private investors appear irrational, though the regressions do not provide any significance. In a market where institutional investors invest irrationally in equities and bonds, commercial investors balance their behaviour in equities and foreign investors in bonds. These conclusions are drawn based on regressions of dividend yield and term spread, but neither provide a consistent picture and are not always both significant for all investors.

Normally when examining model results, one has to consider whether the results are consistent with the EMH or not, and whether this arises because of the joint hypothesis problem. In this paper however, our model specification attempts to adhere closely to the earlier work of Cohen and Drobetz et al. Since our models thus closely align, our results can be compared with disregard towards this problem. However, in terms of establishing whether the three papers as a whole represent an efficient or irrational market, the joint hypothesis problem is still an issue.

The result of the VEC-regression analysis suggests that private and commercial investors lead over foreign investors who follow. While this can come from an information asymmetry giving foreign investors a disadvantage on domestic markets, we are hesitant to draw strong conclusions. Contradicting intuition institutional investors do not lead over foreign investors, a result hard to reconcile with the precious theory. Our result does not conclude on Swedish data what Drobetz et al. (2009) found on Swiss data of private investors following commercial investors.

We believe a key aspect to improve our study will require better and more individual data. Our sample is small compared to earlier studies, and is severely limited by what is available. The results may further be compounded by the financial crisis representing a large portion of our sample period. Future research might have to wait several years before enough new data has been generated.

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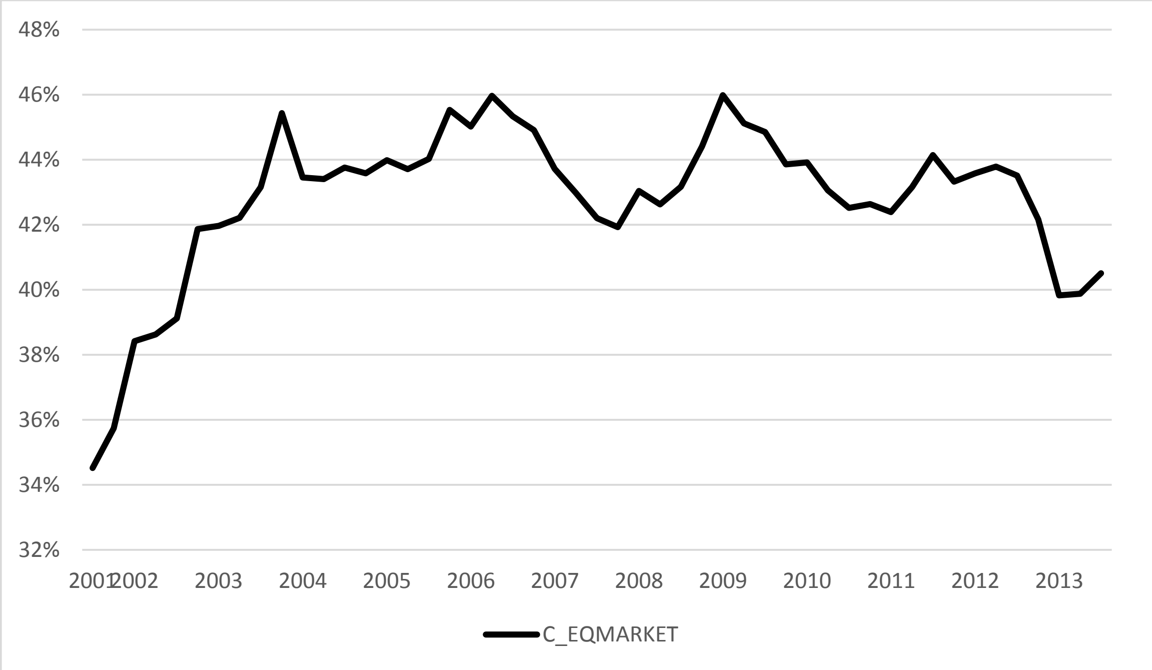
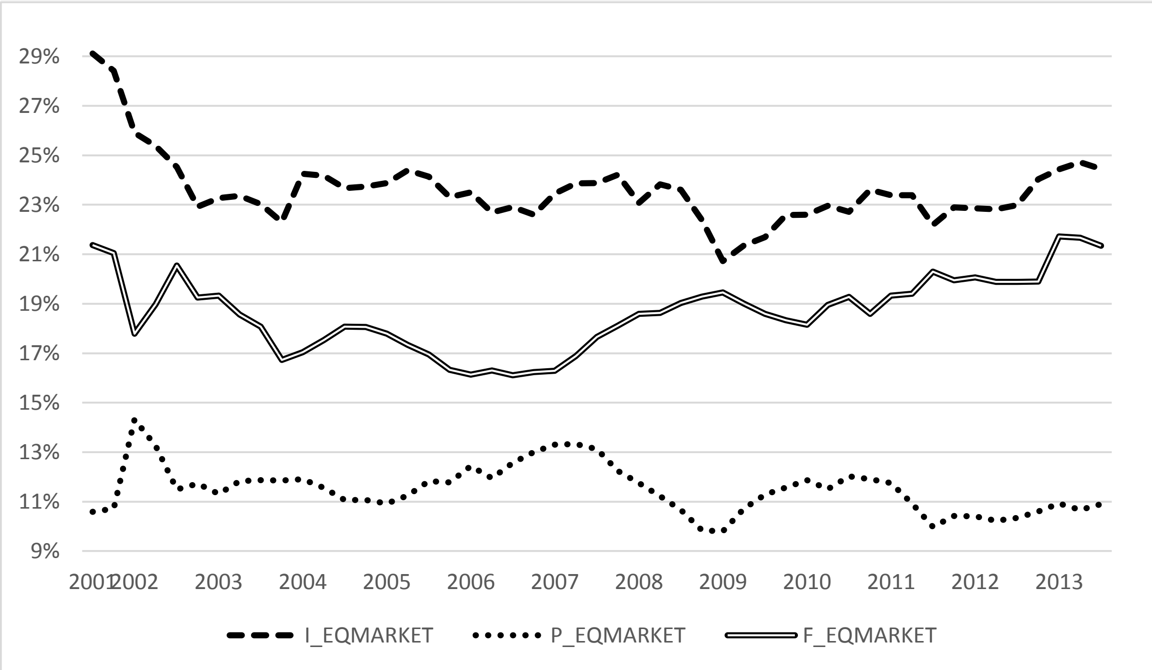
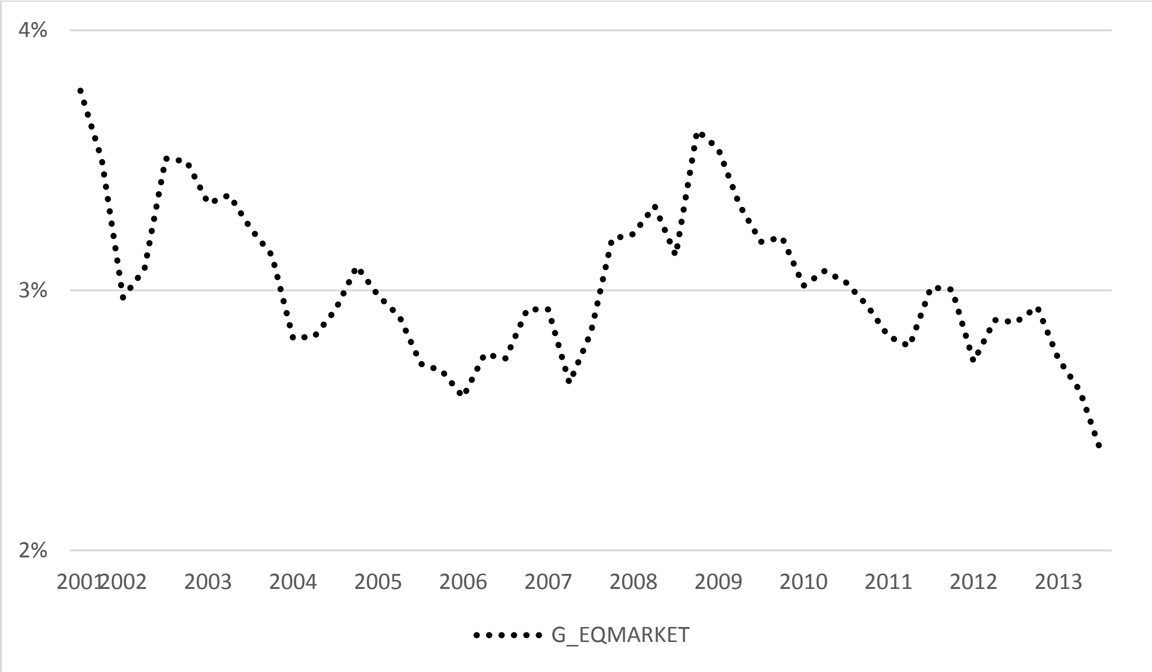
APPENDIX 1: TIME SERIES DIAGRAMS

EQMARKET



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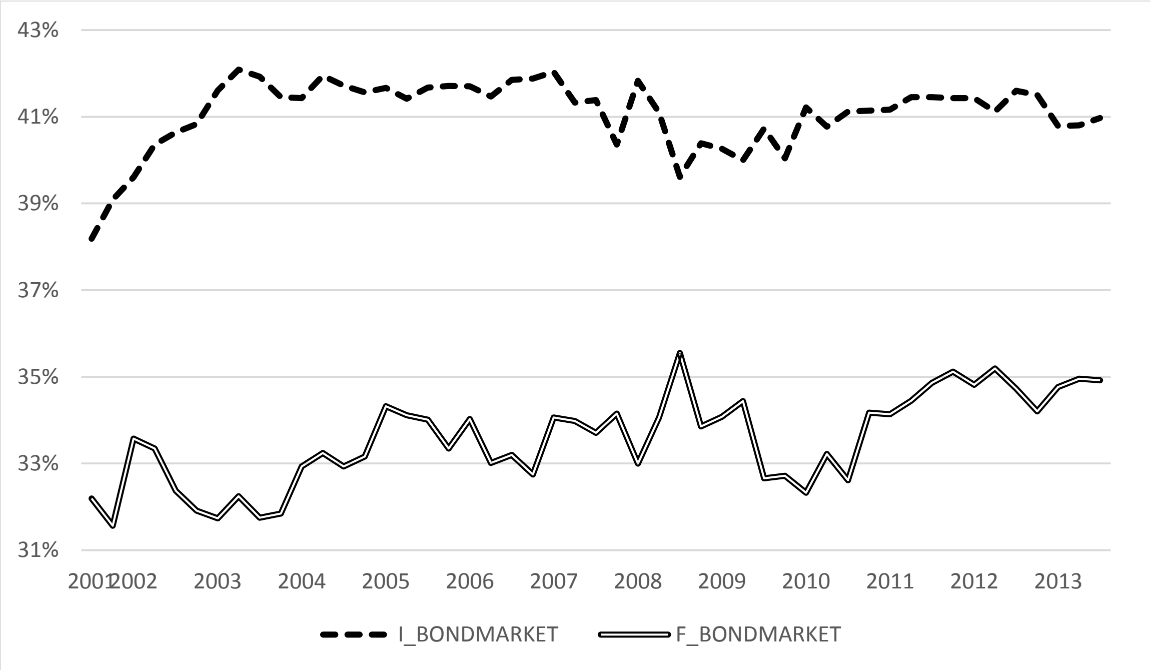
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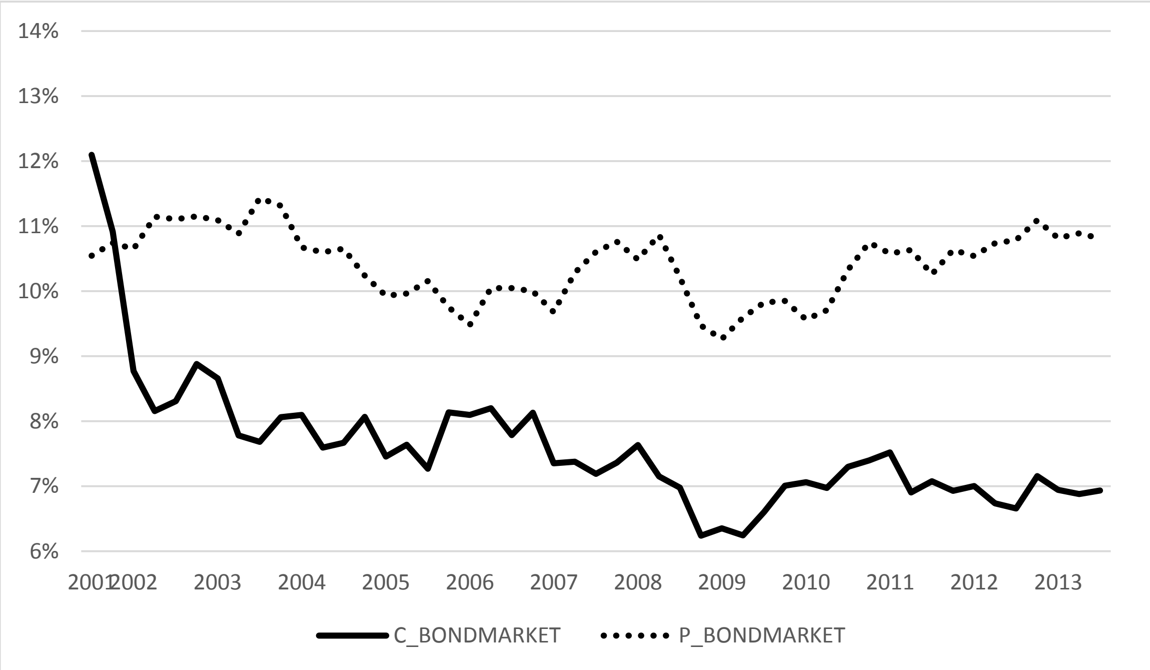
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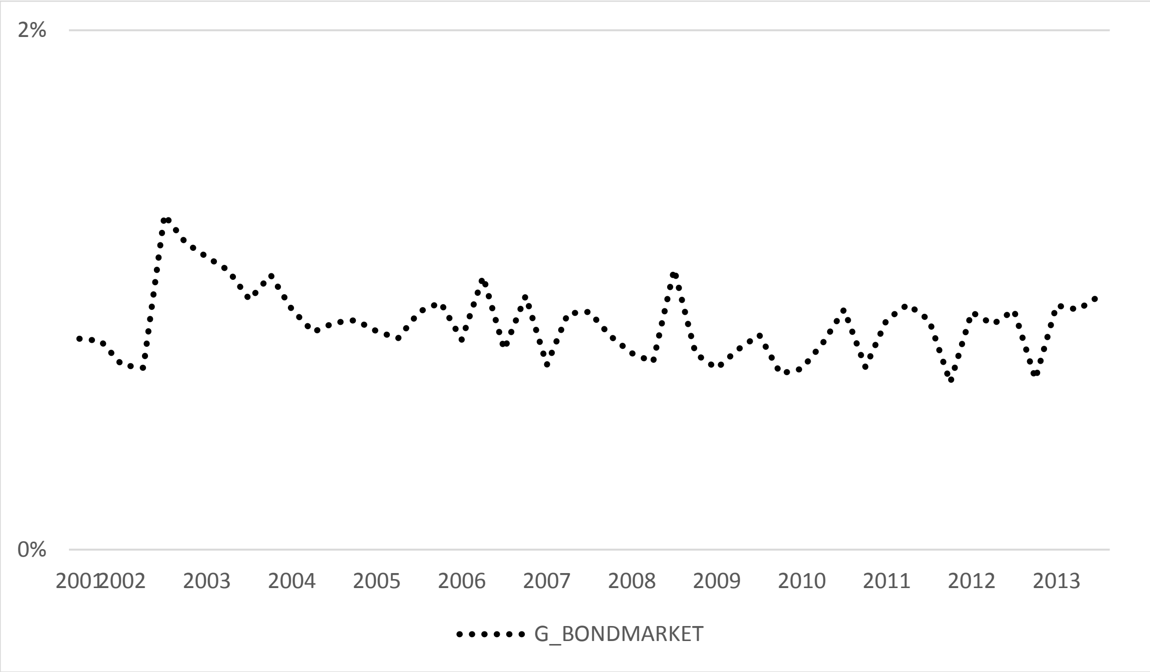
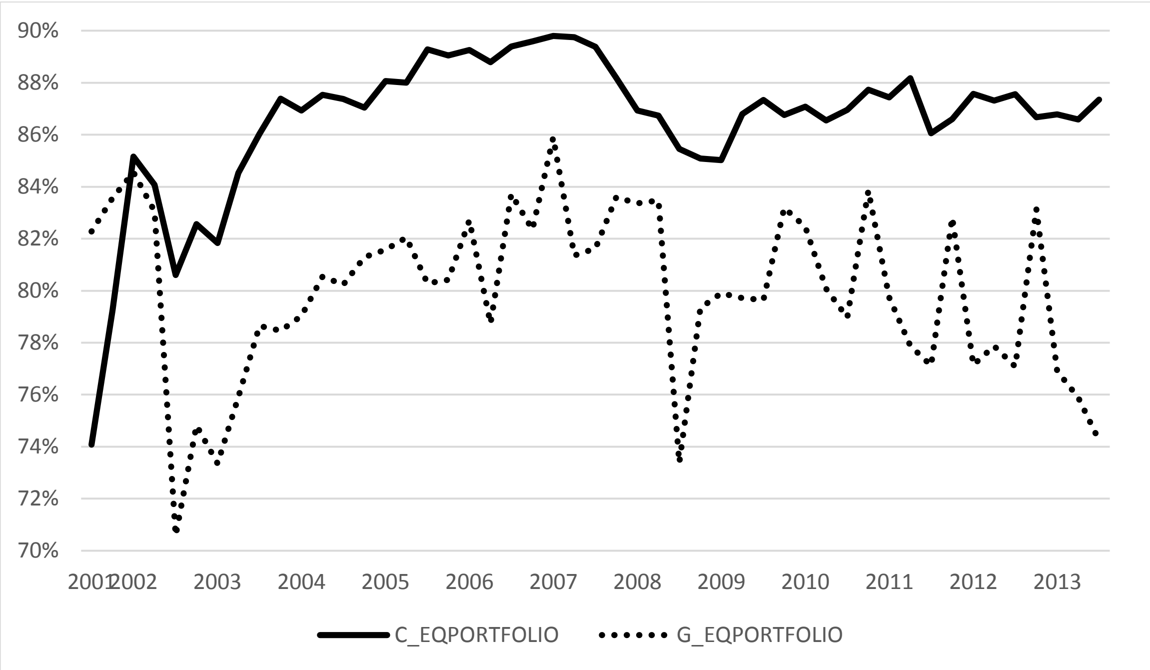
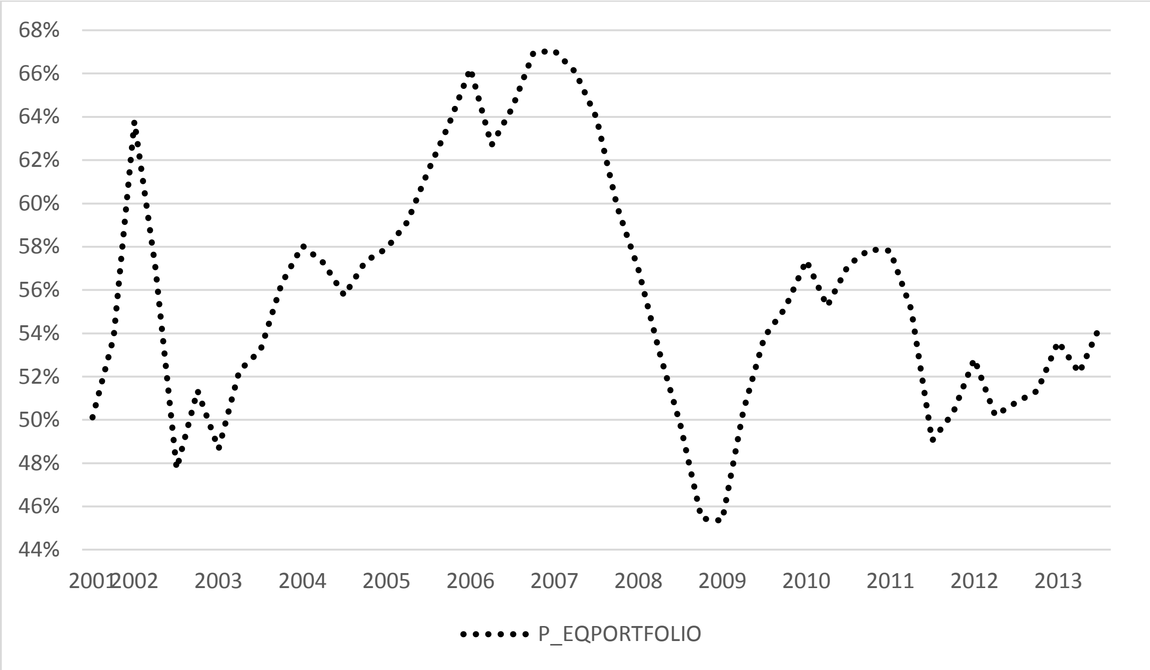


EQPORTFOLIO

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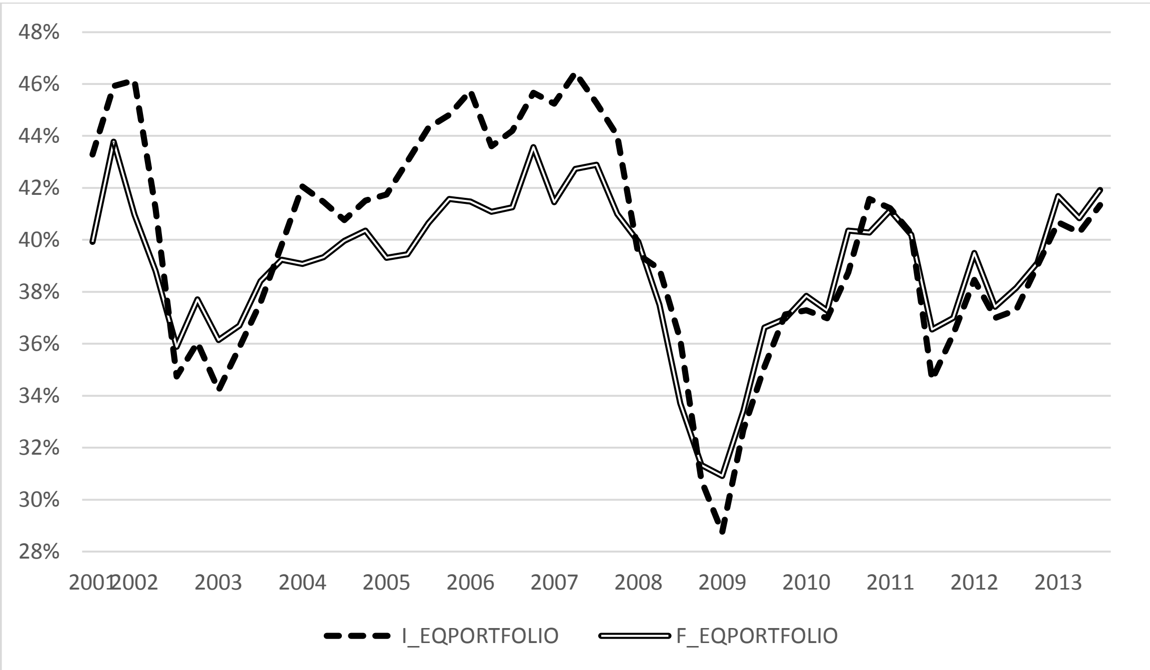
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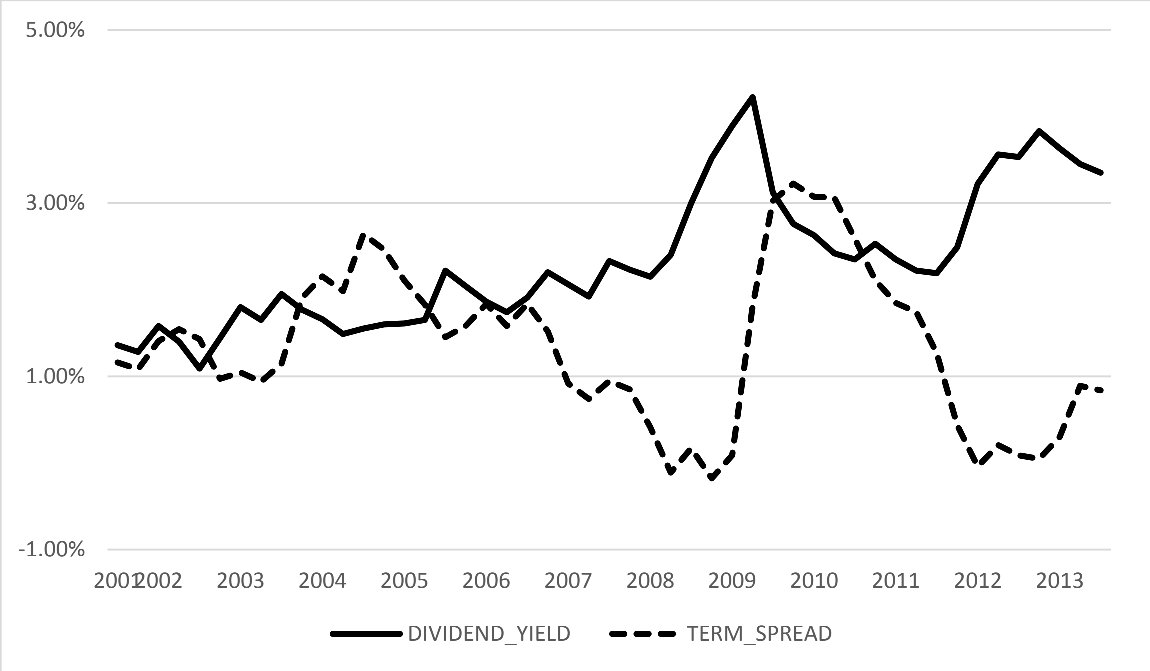
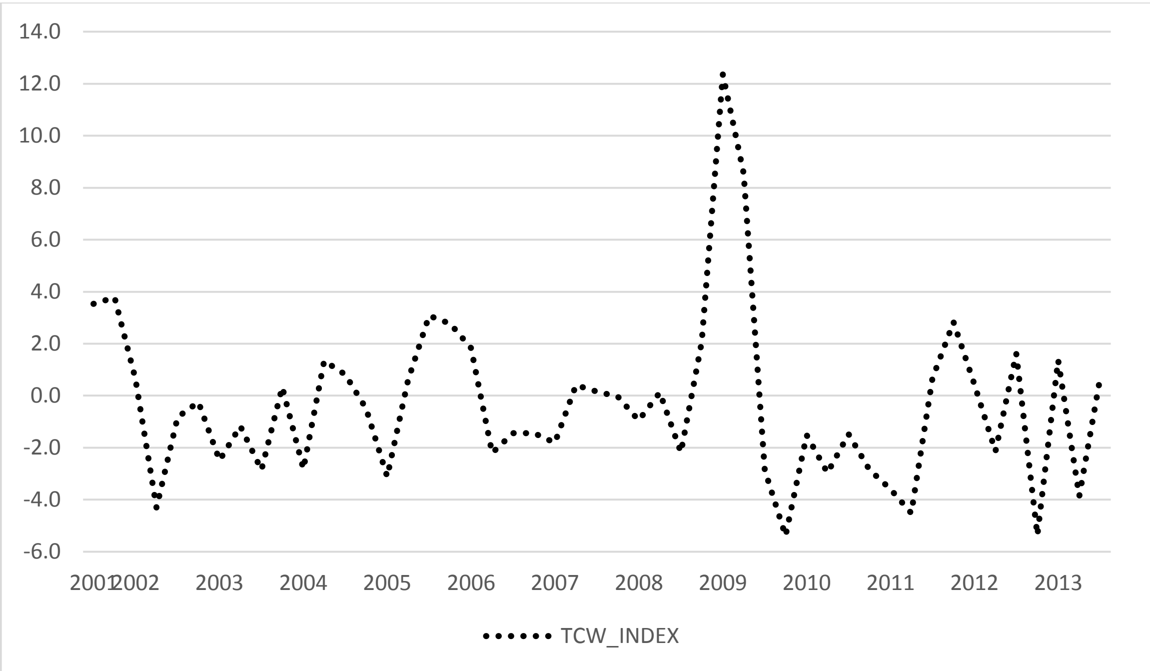
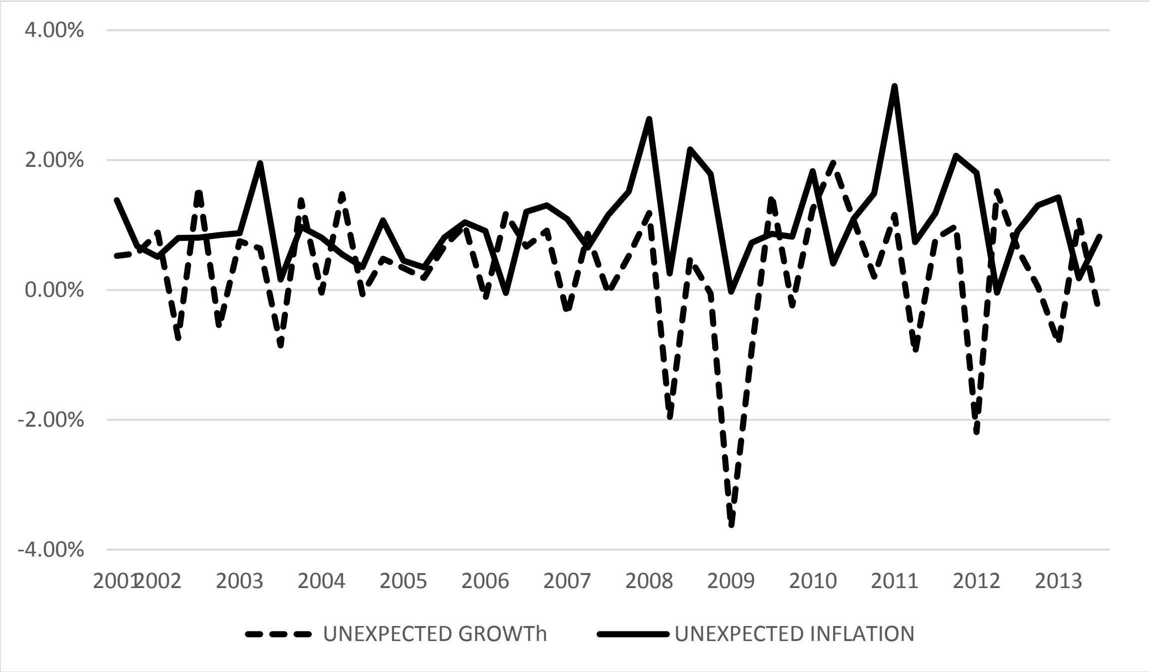
EXPLANATORY VARIABLES







APPENDIX 2: OLS RESULTS

Dependent Variables:

C: Commercial

F: Foreign

FG: Central Government (abbreviation of federal government, an incorrect specification as Sweden is not a federation)

I: Institutional (includes Banks, Insurance Companies, Other Investment Companies and Social Insurance institutions)

P: Private

Dependent Variable: C_BONDSMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.107493	0.004114	26.12886	0.0000
DIVIDEND_YIELD	-1.130460	0.120155	-9.408315	0.0000
TERM_SPREAD	-0.393091	0.105858	-3.713373	0.0006
UNEXPECTED_INFLATION	0.000520	0.000645	0.806679	0.4243
UNEXPECTED_GROWTH	0.000940	0.000453	2.075429	0.0440
TCW_INDEX	0.000592	0.000311	1.905079	0.0635

R-squared	0.581436	Mean dependent var	0.075997
Adjusted R-squared	0.532766	S.D. dependent var	0.010337
S.E. of regression	0.007066	Akaike info criterion	-6.952766
Sum squared resid	0.002147	Schwarz criterion	-6.721115

Log likelihood	176.3428	Hannan-Quinn criter.	-6.864878
F-statistic	11.94643	Durbin-Watson stat	0.753055
Prob(F-statistic)	0.000000		

Dependent Variable: C_EQMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.380284	0.031216	12.18228	0.0000
DIVIDEND_YIELD	1.394924	1.996880	0.698552	0.4886
TERM_SPREAD	1.168448	0.483279	2.417753	0.0199
UNEXPECTED_INFLATION	-0.000858	0.011900	-0.072077	0.9429
UNEXPECTED_GROWTH	-0.001168	0.004038	-0.289285	0.7738
TCW_INDEX	0.000391	0.002253	0.173379	0.8632

R-squared	0.202170	Mean dependent var	0.427784
Adjusted R-squared	0.109399	S.D. dependent var	0.023779
S.E. of regression	0.022441	Akaike info criterion	-4.641575
Sum squared resid	0.021655	Schwarz criterion	-4.409924
Log likelihood	119.7186	Hannan-Quinn criter.	-4.553687
F-statistic	2.179243	Durbin-Watson stat	0.252011
Prob(F-statistic)	0.074111		

Dependent Variable: C_EQPORTFOLIO
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.820080	0.031213	26.27368	0.0000
DIVIDEND_YIELD	1.439854	0.764511	1.883366	0.0664
TERM_SPREAD	0.942376	0.771939	1.220792	0.2288
UNEXPECTED_INFLATION	-0.001956	0.002733	-0.715461	0.4782
UNEXPECTED_GROWTH	-0.000945	0.001994	-0.473765	0.6381
TCW_INDEX	-0.001755	0.001192	-1.472335	0.1482

R-squared	0.158179	Mean dependent var	0.865209
Adjusted R-squared	0.060293	S.D. dependent var	0.028574
S.E. of regression	0.027699	Akaike info criterion	-4.220528
Sum squared resid	0.032992	Schwarz criterion	-3.988876
Log likelihood	109.4029	Hannan-Quinn criter.	-4.132640
F-statistic	1.615949	Durbin-Watson stat	0.381779
Prob(F-statistic)	0.176286		

Dependent Variable: F_BONDSMARKET
Method: Least Squares

Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.319918	0.010489	30.50094	0.0000
DIVIDEND_YIELD	0.757078	0.273136	2.771794	0.0082
TERM_SPREAD	-0.167991	0.261767	-0.641757	0.5244
UNEXPECTED_INFLATIO N	-0.000103	0.001432	-0.071886	0.9430
UNEXPECTED_GROWTH	-3.75E-05	0.001009	-0.037180	0.9705
TCW_INDEX	-0.000253	0.000409	-0.618035	0.5398

R-squared	0.425546	Mean dependent var	0.335586
Adjusted R-squared	0.358748	S.D. dependent var	0.010426
S.E. of regression	0.008349	Akaike info criterion	-6.619164
Sum squared resid	0.002997	Schwarz criterion	-6.387513
Log likelihood	168.1695	Hannan-Quinn criter.	-6.531276
F-statistic	6.370725	Durbin-Watson stat	1.121051
Prob(F-statistic)	0.000165		

Dependent Variable: F_EQMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.174022	0.014203	12.25245	0.0000
DIVIDEND_YIELD	0.669036	0.634941	1.053699	0.2979
TERM_SPREAD	-0.326729	0.231359	-1.412218	0.1651
UNEXPECTED_INFLATIO N	0.000786	0.004137	0.189888	0.8503
UNEXPECTED_GROWTH	0.000428	0.002118	0.201883	0.8410
TCW_INDEX	-0.000172	0.000910	-0.189163	0.8509

R-squared	0.220434	Mean dependent var	0.186479
Adjusted R-squared	0.129786	S.D. dependent var	0.015253
S.E. of regression	0.014229	Akaike info criterion	-5.552818
Sum squared resid	0.008706	Schwarz criterion	-5.321167
Log likelihood	142.0441	Hannan-Quinn criter.	-5.464930
F-statistic	2.431774	Durbin-Watson stat	0.352925
Prob(F-statistic)	0.050036		

Dependent Variable: F_EQPORTFOLIO
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.432882	0.037231	11.62679	0.0000

DIVIDEND_YIELD	-1.562644	1.274097	-1.226472	0.2267
TERM_SPREAD	-0.492835	0.604252	-0.815611	0.4192
UNEXPECTED_INFLATIO N	-0.000144	0.004055	-0.035559	0.9718
UNEXPECTED_GROWTH	0.002710	0.002947	0.919832	0.3628
TCW_INDEX	-0.001521	0.001241	-1.224988	0.2272

R-squared	0.235559	Mean dependent var	0.390277
Adjusted R-squared	0.146670	S.D. dependent var	0.028268
S.E. of regression	0.026113	Akaike info criterion	-4.338499
Sum squared resid	0.029321	Schwarz criterion	-4.106848
Log likelihood	112.2932	Hannan-Quinn criter.	-4.250611
F-statistic	2.650046	Durbin-Watson stat	0.668732
Prob(F-statistic)	0.035635		

Dependent Variable: FG_BONDSMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010825	0.001352	8.009198	0.0000
DIVIDEND_YIELD	-0.051807	0.036316	-1.426564	0.1609
TERM_SPREAD	-0.053631	0.027348	-1.961082	0.0564
UNEXPECTED_INFLATIO N	-0.000256	0.000165	-1.554525	0.1274
UNEXPECTED_GROWTH	0.000312	0.000190	1.639991	0.1083
TCW_INDEX	-3.52E-05	5.32E-05	-0.661658	0.5117

R-squared	0.151280	Mean dependent var	0.008716
Adjusted R-squared	0.052591	S.D. dependent var	0.001411
S.E. of regression	0.001373	Akaike info criterion	-10.22912
Sum squared resid	8.11E-05	Schwarz criterion	-9.997473
Log likelihood	256.6136	Hannan-Quinn criter.	-10.14124
F-statistic	1.532902	Durbin-Watson stat	1.765614
Prob(F-statistic)	0.199776		

Dependent Variable: FG_EQPORTFOLIO
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.803358	0.045841	17.52492	0.0000
DIVIDEND_YIELD	-0.788233	1.164033	-0.677157	0.5019
TERM_SPREAD	0.739380	0.899351	0.822127	0.4155
UNEXPECTED_INFLATIO N	0.006770	0.004293	1.576861	0.1222
UNEXPECTED_GROWTH	-0.005667	0.003649	-1.553004	0.1278
TCW_INDEX	0.000865	0.001302	0.663825	0.5103

R-squared	0.094918	Mean dependent var	0.799552
Adjusted R-squared	-0.010324	S.D. dependent var	0.033246

S.E. of regression	0.033417	Akaike info criterion	-3.845238
Sum squared resid	0.048017	Schwarz criterion	-3.613586
Log likelihood	100.2083	Hannan-Quinn criter.	-3.757350
F-statistic	0.901905	Durbin-Watson stat	1.284929
Prob(F-statistic)	0.488656		

Dependent Variable: FG_EQMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.032510	0.004115	7.900099	0.0000
DIVIDEND_YIELD	*-0.091907*	*0.133193*	*-0.690025*	*0.4939*
TERM_SPREAD	*-0.034043*	*0.095474*	*-0.356565*	*0.7232*
UNEXPECTED_INFLATIO N	0.000555	0.000449	1.234748	0.2236
UNEXPECTED_GROWTH	-0.000275	0.000362	-0.760355	0.4512
TCW_INDEX	0.000245	0.000154	1.589951	0.1192

R-squared	0.122827	Mean dependent var	0.030279
Adjusted R-squared	0.020830	S.D. dependent var	0.002966
S.E. of regression	0.002935	Akaike info criterion	-8.709690
Sum squared resid	0.000371	Schwarz criterion	-8.478039
Log likelihood	219.3874	Hannan-Quinn criter.	-8.621802
F-statistic	1.204221	Durbin-Watson stat	0.629483
Prob(F-statistic)	0.323415		

Dependent Variable: I_BONDSMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.427430	0.008068	52.97532	0.0000
DIVIDEND_YIELD	0.068512	0.230142	0.297694	0.7674
TERM_SPREAD	0.113870	0.191541	0.594493	0.5553
UNEXPECTED_INFLATIO N	0.000306	0.001259	0.243450	0.8088
UNEXPECTED_GROWTH	6.64E-05	0.000697	0.095276	0.9245
TCW_INDEX	-0.000603	0.000372	-1.619559	0.1126

R-squared	0.073201	Mean dependent var	0.431104
Adjusted R-squared	-0.034566	S.D. dependent var	0.008644
S.E. of regression	0.008792	Akaike info criterion	-6.515581
Sum squared resid	0.003324	Schwarz criterion	-6.283930
Log likelihood	165.6317	Hannan-Quinn criter.	-6.427693
F-statistic	0.679250	Durbin-Watson stat	0.451757
Prob(F-statistic)	0.641525		

Dependent Variable: I_EQMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.273599	0.013923	19.65019	0.0000
DIVIDEND_YIELD	-1.149545	0.531162	-2.164207	0.0360
TERM_SPREAD	-0.726581	0.234909	-3.093035	0.0035
UNEXPECTED_INFLATIO N	-0.000879	0.002114	-0.415740	0.6797
UNEXPECTED_GROWTH	0.001442	0.001144	1.260330	0.2143
TCW_INDEX	2.48E-05	0.000679	0.036561	0.9710

R-squared	0.327200	Mean dependent var	0.236059
Adjusted R-squared	0.248967	S.D. dependent var	0.014357
S.E. of regression	0.012442	Akaike info criterion	-5.821244
Sum squared resid	0.006656	Schwarz criterion	-5.589592
Log likelihood	148.6205	Hannan-Quinn criter.	-5.733355
F-statistic	4.182403	Durbin-Watson stat	0.490637
Prob(F-statistic)	0.003480		

Dependent Variable: I_EQPORTFOLIO
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.474583	0.079189	5.993067	0.0000
DIVIDEND_YIELD	-3.045673	2.110058	-1.443408	0.1562
TERM_SPREAD	-0.997515	1.387394	-0.718985	0.4760
UNEXPECTED_INFLATIO N	-0.002661	0.004254	-0.625500	0.5349
UNEXPECTED_GROWTH	0.003621	0.003871	0.935377	0.3548
TCW_INDEX	-0.001082	0.002147	-0.503932	0.6169

R-squared	0.310344	Mean dependent var	0.387565
Adjusted R-squared	0.230152	S.D. dependent var	0.041552
S.E. of regression	0.036458	Akaike info criterion	-3.671026
Sum squared resid	0.057155	Schwarz criterion	-3.439374
Log likelihood	95.94013	Hannan-Quinn criter.	-3.583138
F-statistic	3.869990	Durbin-Watson stat	0.504182
Prob(F-statistic)	0.005529		

Dependent Variable: P_BONDSMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	0.116882	0.004597	25.42444	0.0000
DIVIDEND_YIELD	-0.292913	0.139310	-2.102600	0.0414
TERM_SPREAD	-0.387194	0.079720	-4.856902	0.0000
UNEXPECTED_INFLATIO N	-0.000760	0.000854	-0.890260	0.3783
UNEXPECTED_GROWTH	0.000102	0.000304	0.336385	0.7382
TCW_INDEX	-0.000711	0.000154	-4.624636	0.0000

R-squared	0.413314	Mean dependent var	0.104193
Adjusted R-squared	0.345094	S.D. dependent var	0.005392
S.E. of regression	0.004363	Akaike info criterion	-7.916939
Sum squared resid	0.000819	Schwarz criterion	-7.685288
Log likelihood	199.9650	Hannan-Quinn criter.	-7.829051
F-statistic	6.058603	Durbin-Watson stat	0.785935
Prob(F-statistic)	0.000250		

Dependent Variable: P_EQMARKET
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.132204	0.008194	16.13380	0.0000
DIVIDEND_YIELD	-0.732440	0.181309	-4.039724	0.0002
TERM_SPREAD	-0.041954	0.199063	-0.210756	0.8341
UNEXPECTED_INFLATIO N	0.000709	0.000843	0.840888	0.4051
UNEXPECTED_GROWTH	-0.000391	0.000629	-0.621252	0.5377
TCW_INDEX	-0.000506	0.000186	-2.719649	0.0094

R-squared	0.379114	Mean dependent var	0.115017
Adjusted R-squared	0.306918	S.D. dependent var	0.009812
S.E. of regression	0.008169	Akaike info criterion	-6.662764
Sum squared resid	0.002869	Schwarz criterion	-6.431113
Log likelihood	169.2377	Hannan-Quinn criter.	-6.574876
F-statistic	5.251166	Durbin-Watson stat	0.880897
Prob(F-statistic)	0.000752		

Dependent Variable: P_EQPORTFOLIO
Method: Least Squares
Date: 05/06/14 Time: 12:01
Sample: 2001Q3 2013Q3
Included observations: 49
HAC standard errors & covariance (Prewhitening with lags = 1, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.613197	0.076187	8.048561	0.0000
DIVIDEND_YIELD	-2.806488	1.780857	-1.575920	0.1224
TERM_SPREAD	0.694186	1.280638	0.542062	0.5906
UNEXPECTED_INFLATIO N	0.002008	0.004595	0.436994	0.6643
UNEXPECTED_GROWTH	0.001200	0.004613	0.260199	0.7960
TCW_INDEX	-0.001097	0.002320	-0.472655	0.6388

R-squared	0.242217	Mean dependent var	0.558667

Adjusted R-squared	0.154103	S.D. dependent var	0.056559
S.E. of regression	0.052019	Akaike info criterion	-2.960132
Sum squared resid	0.116358	Schwarz criterion	-2.728480
Log likelihood	78.52323	Hannan-Quinn criter.	-2.872244
F-statistic	2.748893	Durbin-Watson stat	0.443821
Prob(F-statistic)	0.030567		

Dependent Variable: C_BONDSMARKET-CASH
Method: Least Squares
Date: 05/07/14 Time: 13:28
Sample: 2001Q3 2013Q3
Included observations: 49

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.046420	0.004963	9.353981	0.0000
DIVIDEND_YIELD_MID	-0.819190	0.148737	-5.507623	0.0000
TERM_SPREAD	-0.305152	0.135630	-2.249880	0.0296
UNEXPECTED_INFLATIO N	-2.70E-05	0.001551	-0.017401	0.9862
UNEXPECTED_GROWTH	0.000759	0.001089	0.697242	0.4894
TCW_INDEX	0.000702	0.000336	2.090956	0.0425

R-squared	0.450297	Mean dependent var	0.022852
Adjusted R-squared	0.386378	S.D. dependent var	0.008720
S.E. of regression	0.006830	Akaike info criterion	-7.020602
Sum squared resid	0.002006	Schwarz criterion	-6.788951
Log likelihood	178.0048	Hannan-Quinn criter.	-6.932714
F-statistic	7.044820	Durbin-Watson stat	0.627192
Prob(F-statistic)	0.000069		

APPENDIX 3 VAR-ANALYSIS RESULTS

Johansens Test

Date: 04/08/14 Time: 11:56
Sample (adjusted): 2002Q1 2013Q3
Included observations: 47 after adjustments
Trend assumption: Linear deterministic trend
Series: C_EQPORTFOLIO F_EQPORTFOLIO I_EQPORTFOLIO P_EQPORTFOLIO
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.508641	60.03870	47.85613	0.0024
At most 1	0.284810	26.64139	29.79707	0.1107
At most 2	0.168226	10.88668	15.49471	0.2185
At most 3	0.046329	2.229522	3.841466	0.1354

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unit Root Test

Null Hypothesis: Unit root (individual unit root process)
Series: C_EQPORTFOLIO, F_EQPORTFOLIO, I_EQPORTFOLIO, P_EQPORTFOLIO
Date: 05/26/14 Time: 12:27
Sample: 2001Q3 2013Q3
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 188
Cross-sections included: 4

Method	Statistic	Prob.**
ADF - Fisher Chi-square	26.2117	0.0010
ADF - Choi Z-stat	-3.46372	0.0003

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results UNTITLED

Series	Prob.	Lag	Max Lag	Obs
C_EQPORTFOLIO	0.0069	1	1	47
F_EQPORTFOLIO	0.0634	1	1	47
I_EQPORTFOLIO	0.0382	1	1	47
P_EQPORTFOLIO	0.1219	1	1	47