

BUSINESS MODELS OF REAL ESTATE EQUITY COMPANIES AND CAPITAL MARKET VOLATILITY

Rupert K. Eisfeld^{*}
Tobias Just^{*}
Karl-Friedrich Keunecke^{**}

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^{*} IWU – Institute for Housing and Environment

^{*} IREBS – University of Regensburg

* corresponding author: karl-friedrich.keunecke@irebs.de

BUSINESS MODELS OF REAL ESTATE EQUITY COMPANIES AND CAPITAL MARKET VOLATILITY – EXTENDED ABSTRACT

Introduction

Real estate shares can contribute to mixed-asset portfolios achieving higher returns with the same level of risk. This is all the more successful if the special characteristics and differences of individual sub-segments in the real estate equity universe can be taken into account. Numerous studies on volatilities and return developments on real estate stock markets have therefore attempted to separate the entire stock universe into different sub-segments. In most cases, regional sub-portfolios or sector-specific sub-portfolios are formed, or different investment types are separated, e.g. opportunistic versus risk-averse core investors. A consideration of the business models of the real estate stock companies with regards to positions on the value chain of the real estate industry seem not to play a role. It is thus implicitly assumed that the heterogeneity of company performance results from these three distinguishing features (sector, region, investment type); no additional consideration of business segments along the real estate value chain is made.

This article presents an innovative approach that assigns real estate stock companies in the DACH region (Germany, Austria, Switzerland) to four business model-specific clusters. For this purpose, business models of real estate stock companies are understood as activities that constitute a long-term strategy. For this purpose, the turnover structures of the companies are examined separately according to two dimensions: On the one hand, the invested sectors (residential, office, retail, etc.) are considered and, at the same time, on the other hand, the business segments a company is active in across the value chain, i.e. whether a company is active as a developer, investor or, for example, as a service provider).¹

It is additionally shown that the volatility development of the share price developments of these four clusters differed significantly over the analysis period from 2016 to 2022. In addition, it is shown with the help of Granger causality tests that there have been (comparatively) stable lead-lag structures of these four clusters over the period, and it is shown with the help of a change-point analysis (Pruned Exact Linear Time (PELT) method) that these different lead-lag structures lead to different turning points with regard to volatility developments even in the case of large macroeconomic shocks such as the Covid-19 pandemic or the interest rate reversal since late-2021/early-2022. Especially for opportunistic investors, timing strategies could result from these findings.

To our best knowledge this is the first study on (DACH) real estate equity companies that attempts to cluster the stock companies simultaneously with regards to sectors and business segments.

Research questions

Three research questions are examined in this article:

RQ1: Can real estate stock companies in German-speaking countries be assigned to meaningful business models on the basis of turnover focuses and with a view to different volatility developments?

RQ2: Are there lead-lag structures between the isolated clusters of business model types?

¹ We did not consider the regional aspect as a likely third pillar of a business model, as three dimensions would lead to very granular clusters. In this first analytical stage we thus restricted the business model definition to only two dimensions: asset class and focus within the value chain.

RQ3: Are these lead-lag structures stable in view of the recent macroeconomic shocks, in particular the Covid-19 pandemic as well as the subsequent interest rate hike period?

Methodology

A four-stage analysis was chosen.

Stage 1: Determination of business models: In the context of this paper business models are understood as a combination of business segment and sectors. The turnover of the real estate companies are classified into six business segments (development, construction, transaction, rental, services, other) and six different sectors (residential, office, retail, hotel, logistics and special use) with the help of the companies' annual reports as well as additional survey results collected by investor relations departments of the companies to confirm the initial analysis. The activities were then condensed into a fragmentation index (1-Hirschman-Herfindahl index of these activities). This fragmentation data was then assigned to four clusters using the Ward clustering method and applying the Euclidean distance and isolating the maximum Silhouette index.

Stage 2: Weighed stock indices were then computed for the four clusters, and three different volatility measures were calculated (standard deviation, maximum drawdown and Sharpe ratio).

Stage 3: Granger causality tests were then used to control whether there were lead-lag structures of these four cluster stock indices due to differences in information efficiency.

Stage 4: Finally, with the help of the PELT method, it is tested whether this sequence is also evident in the phases of particularly high volatility changes, i.e. in the early phase of the Covid-19 pandemic, during the pandemic period and at the beginning of the interest rate change phase. In addition, correlations of the cluster index developments with macroeconomic and real estate economic indicators were computed.

Results

Results of the cluster analysis (stage 1). According to the Silhouette index, the cluster analysis reveals an optimal division into four clusters (a division into eight clusters also makes mathematical sense with a somewhat lower Silhouette index; however, this is not pursued further in the article because it leads in part to very small and thus idiosyncratic clusters). For the selected real estate stock universe, the four clusters can be identified as follows: Property Developers; Investors and Asset Managers; Residential Portfolio Holders; Portfolio Holders of Mixed Portfolios. The following figure illustrates the clusters using a phylogram.

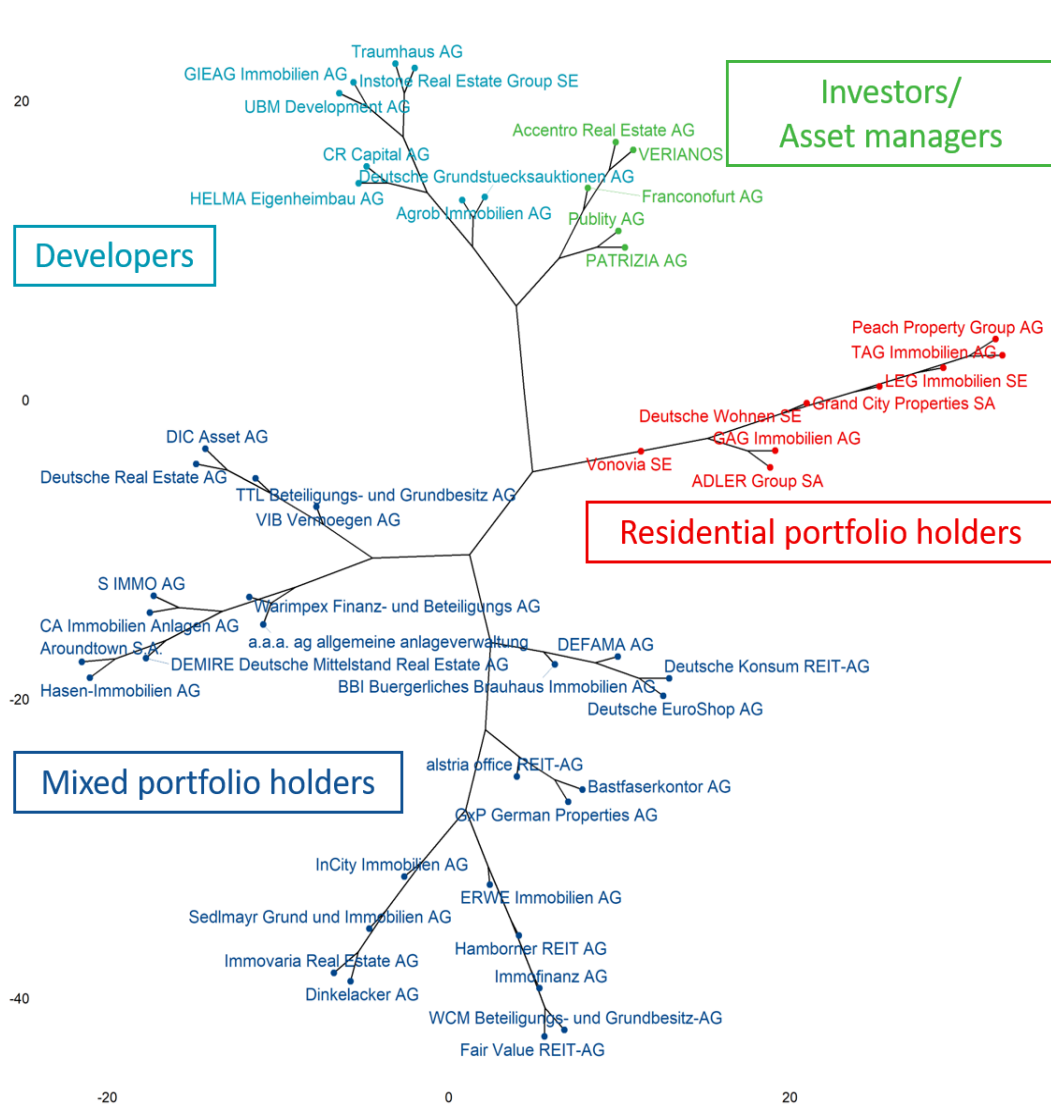


Exhibit 1: Phylogram of the cluster analysis and resulting individual business models (named).

The second stage of the analysis shows that especially (but not only) during the Covid-19 years as well as after the interest rate turnaround, clearly different dynamics of the four cluster indices emerge. The following figure shows the development of the four indices for the four clusters.

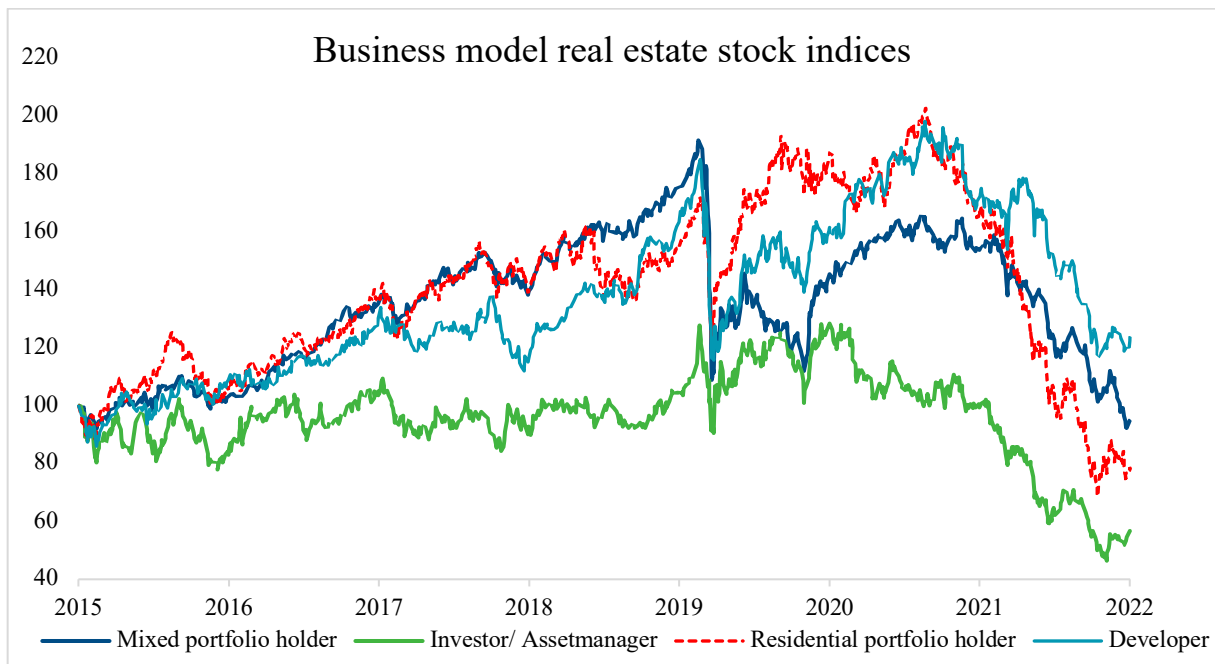


Exhibit 2: Index performance of business models (Base: 12/31/2015 = 100).

And the following table illustrates that the three volatility measures chosen, although not in all cases, show deviations from other clusters, especially for real estate developers.

	Mixed portfolio holders	Residential portfolio holders	Investors/ asset managers	Developers
Std. Dev.	0.0104	0.0142	0.0156	0.0118
MDD(T)	-0.5206	-0.6624	-0.6380	-0.4107
Sharpe Ratio	-0.0035	-0.0167	-0.0299	0.0020

Exhibit 3: Performance of business models according to selected volatility measures.

The price discovery processes between the four business models is consequently analyzed by means of a Granger causality test, as common the literature when comparing the information efficiency of real estate markets as well as the causality dependency on underlying sectors and associated business activities, the perspective on which this paper builds. The results of the Granger causality tests (stage 3) based on a VAR(4) model show that in the chosen analysis window, the mixed portfolio holders appear to be ahead of the other clusters, at least for the models in which the tests show statistically significant results.

	<i>F</i>	<i>df</i> ₁	<i>df</i> ₂	<i>p</i>		χ^2	<i>df</i>	<i>p</i>
Mixed portfolio holder ← Residential portfolio holder		4	1767	.057	.	9.18	4	.057
Mixed portfolio holder ← Investor/Assetmanager	1.44	4	1767	.219		5.75	4	.218
Mixed portfolio holder ← Developer	1.80	4	1767	.126		7.20	4	.126
Mixed portfolio holder ← ALL	1.69	12	1767	.062	.	20.33	12	.061
Residential portfolio holder ← Mixed portfolio holder	2.40	4	1767	.048	*	9.61	4	.047
Residential portfolio holder ← Investor/Assetmanager	2.44	4	1767	.045	*	9.76	4	.045
Residential portfolio holder ← Developer	1.01	4	1767	.400		4.05	4	.400
Residential portfolio holder ← ALL	1.85	12	1767	.037	*	22.15	12	.036
Investor/Assetmanager ← Mixed portfolio holder	3.01	4	1767	.017	*	12.02	4	.017
Investor/Assetmanager ← Residential portfolio holder	1.31	4	1767	.265		5.23	4	.264
Investor/Assetmanager ← Developer	0.90	4	1767	.464		3.60	4	.463
Investor/Assetmanager ← ALL	2.84	12	1767	<.001	***	34.09	12	<.001
Developer ← Mixed portfolio holder	8.76	4	1767	<.001	***	35.03	4	<.001
Developer ← Residential portfolio holder	0.50	4	1767	.737		1.99	4	.737
Developer ← Investor/Assetmanager	1.27	4	1767	.281		5.06	4	.281
Developer ← ALL	5.74	12	1767	<.001	***	68.94	12	<.001

*Exhibit 4: Granger causality test results based on a VAR (4) model: * $p > 0.05$. ** $p > 0.01$. *** $p > .001$.*

For the fourth stage of the analysis, change points in the volatility development were searched for applying the PELT method. This analysis shows that four starting points of homogeneous phases can be distinguished for all four clusters, and the analysis also reveals that these phases start/end at different times for the four clusters. These phases can be named reference period (pre-covid), Covid-19 shock phase, Covid-19 pandemic phase and interest rate reversal phase.

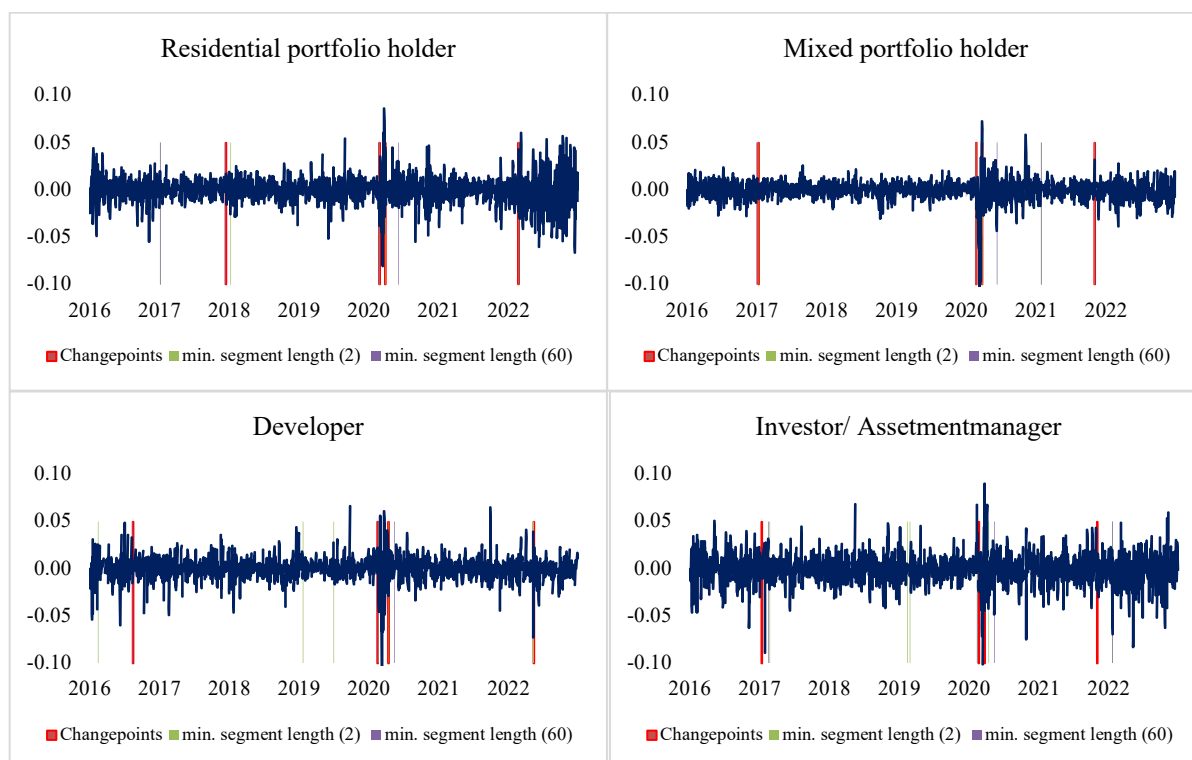


Exhibit 5: Change points of individual market phases (PELT) – return volatility.

What is more, in this analysis, the phases for the mixed portfolio holders start in three out of four phases. In some cases, the other clusters even follow with a delay of a few weeks.

	Reference period	Covid-19 shock	Pandemic phase	Interest rate reversal
Mixed portfolio holders	12.01.2017 (2)	22.02.2020 (3)	25.03.2020 (1)	04.11.2021 (1)
Residential portfolio holders	15.12.2017 (4)	27.02.2020 (4)	31.03.2020 (2)	24.02.2022 (3)
Investors/ Asset managers	18.02.2017 (3)	14.02.2020 (1)	16.04.2020 (3)	22.01.2022 (1)
Developers	17.08.2016 (1)	19.02.2020 (2)	16.04.2020 (3)	14.05.2022 (4)

Exhibit 6: Change points of individual market phases (PELT). Chronological order of dates presented in brackets (.).

The business models are relatively synchronous up to the pandemic in terms of their volatility measures but have reacted asymmetrically during the interest rate reversal as can be examined from exhibit 7: developers and mixed portfolio holders remain at a reasonable level with slightly higher downturns whilst residential portfolio holders and investors/asset managers display negative development of both volatility measures.

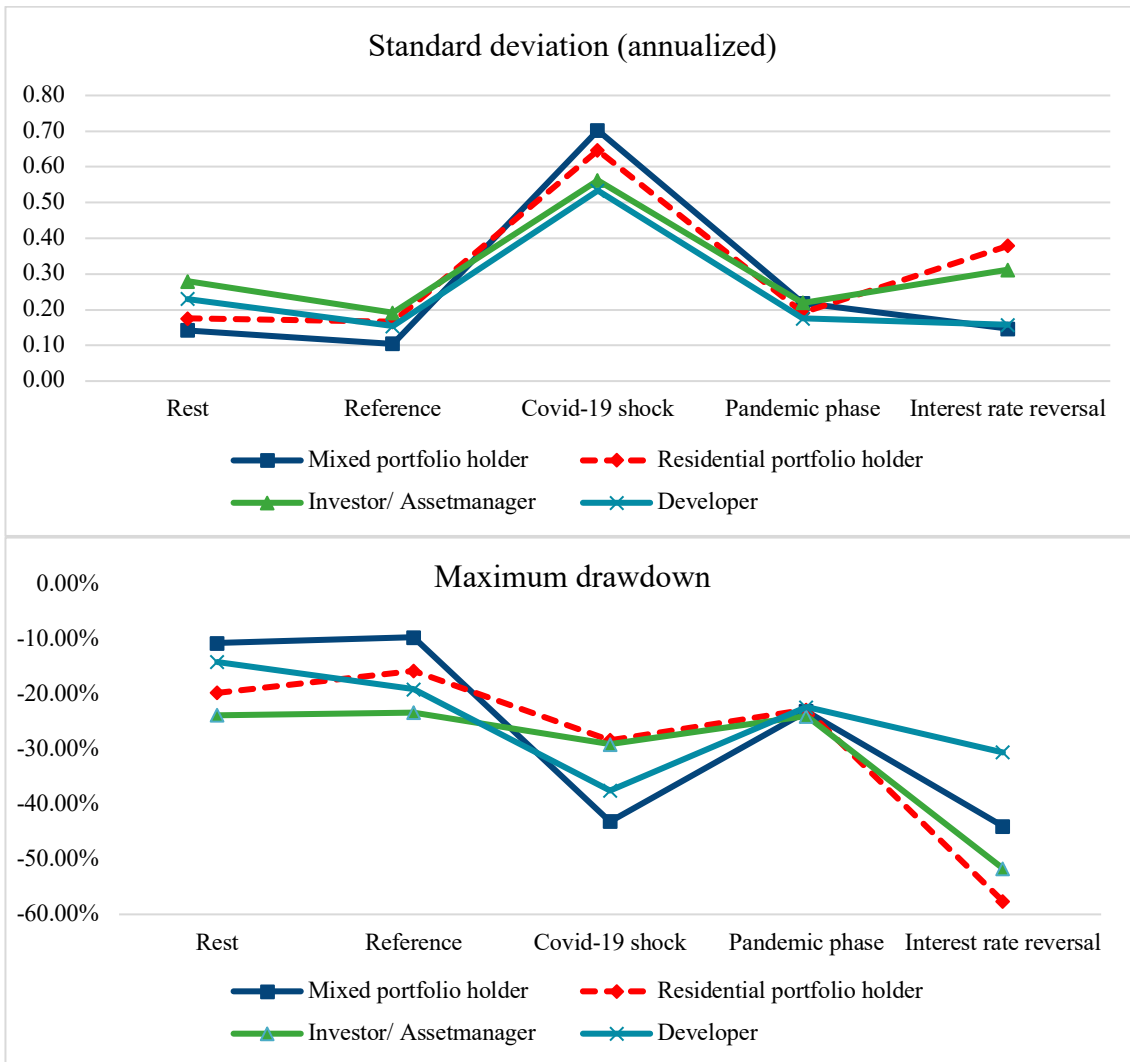


Exhibit 7: Performance of different business models in each market phase identified via PELT method.

Concluding remarks

The three research questions could therefore be answered as follows: The real estate companies in the German-speaking equity universe can be assigned to four ideal clusters (mixed portfolio holders, residential portfolio holders, investors and asset managers, real estate developers) according to the allocation of turnover by asset class and market segment. These four clusters show considerable differences in share price development and share price volatility.

Furthermore, it could be shown that four clearly separable volatility phases can be distinguished for all four clusters during the study period. Both the Granger causality test and the change point analyses showed that the mixed portfolio holders were most likely to have run ahead of the other three clusters here.

This would then be an important finding for investors and financial institutions, because the development of one cluster could then act as an early-bird indicator for the development of the other business models. However, the results also show that the intervals between the different phase starts are not stable.

This analysis raises a number of possible follow-up questions that are not addressed in this article: First, there is the question of whether the regional component is defining part of a business model distinction and whether the clusters found can provide additional information to traditional stock allocations. Furthermore, this paper focused on volatilities. Follow-up research may focus on other key indicators, e.g. return data or individual items in the balance sheet or income statement. Finally, the analyzed time period is short due to the restriction to

German-speaking countries and the special focus on the Covid-19 and post-Covid-19 periods. The question therefore arises as to whether a wider time window would result in other clusters and other volatility or yield sequences. Here, a transfer to other regions (USA or other European countries) would be a sensible follow-up project.

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