

Mixed-use real estate development in a portfolio diversification point of view

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The financial crisis and economic recession revealed the vulnerability of the real estate development branch as a result of volatility on the markets. The complex process of real estate development requires understanding of both the markets to be traded on and segments within these markets. The research investigates how a real estate development company is able to apply a diversification strategy in the development portfolio. The reduction in market risk as a result of portfolio diversification is calculated using the market risks of office, retail and residential developments, based on long term time series of the construction market, the space market and investment market. Market risk may be decreased by 18% - 20% by developing retail and residential space. Operational risks tend to increase when mixing multiple segments within a building or within a company.

Key words: real estate, development, market risk, diversification, mixed-use

This paper describes the opportunities and applications of diversification in real estate development portfolios. The paper contains five sections. First, the introduction describes the theoretical framework, the motives and the goal of the research. The second section provides the methods and data used. Part 3 provides the results of the analysis. Thereafter section 4 provides conclusions and answers the main question. Finally section 5 contains the discussion.

1. INTRODUCTION

The introduction starts with the description of the applied theoretical framework. Thereafter the motive is explained. Finally the goal of the research is described.

The research considers real estate development in a framework of markets and segments within these markets. A real estate developer invests in the development and realization of real estate projects, intended for the market (Nozeman, 2008). During the process the developer trades at seven markets, known as (1) the land market, (2) the planning market, (3) the design market, (4) the

capital market, (5) the construction market, (6) the space market, and (7) the asset market (Gehner, 2008). The construction market, space market and asset market are known as the most volatile markets. The volatility of these markets, combined with long term development processes generates uncertainty in the final result of the development. This uncertainty can be addressed as market risk by determining the probability and the consequences of a negative impact.

The increasing demand for mixed-use real estate combined with the highly segmented Dutch practice provides the opportunity to investigate the effects of risk response methods based on diversification theory. A widely accepted tool in corporate finance to reduce market risks is a diversification strategy. The Dutch real estate sector, including development companies, shows highly segmented based on the user function of the real estate. The demand for mixed-use real estate increases as a result of a changing urban paradigm, which is firstly nominated by Jacobs (1961) in her book 'the life and death of great American cities'.

The investigation of the portfolio diversification in real estate development is demarcated on a functional segmentation of the Dutch market. The used segments comprise office developments, retail developments, and residential developments, both lettable and owner occupied. The regional differences are ignored due to the time available for the research. The main research question is: is a diversification in the real estate development portfolio an applicable method to reduce the effects of market risk?

Since diversification is hardly successfully applied in practice, methods for successful application are required. The goal of the research is twofold. The first goal is to quantify market risks and the diversification potential. The second goal is to provide risk control measures which decrease the effects of market risk on the result of real estate development. The quantification of the market risks and the diversification potential in real estate development is calculated based on long term time series in the period 1995 - 2009. The results of the quantitative research are used as input for the qualitative research. An expert panel is used to define the restrictions, conditions, and operational risks for the successful application of diversification strategies in practice. Conclusions are based on the results of the two methodologies.

2. RESEARCH METHODOLOGY

The section describes the methods and data used in the research. Two separate methodologies are applied. Section 2.1 starts with the research method and data of the quantitative research. Thereafter the applied qualitative method is clarified.

2.1 Quantitative research method

The data analysis is based on three steps. First, time series of the space market, the investment market and the construction market are combined. Secondly, the market risks are calculated based on the quantification of the probability and consequences of negative effects. Thirdly, the diversification potential is calculated based on market risks and risk premiums.

Combining time series

The space market and the construction market are measured in rental prices and construction prices per square meter floor area. The investment market is measured in gross initial yields. The time series are combined per segment, i.e. office space, retail space, rental residential space and owner occupied residential space. The combination for commercial real estate is performed using the equation (1) below

$$V_i(t) = \frac{R_i(t)}{GIY_i(t)} - C_i(t) \quad (1)$$

where $V_i(t)$ is the combined value of segment i in year t , $R_i(t)$ is the rental price per square meter of segment i in year t , $GIY_i(t)$ is the gross initial yield in year t and $C_i(t)$ is the construction price of segment i in year t . The combination of data series for owner occupied dwellings is performed using the equation (2) below

$$V_i(t) = SP_i(t) - C_i(t) \quad (2)$$

where $V_i(t)$ is the combined value of segment i in year t , $SP_i(t)$ is the selling price of segment i in year t , and $C_i(t)$ is the construction price of segment i in year t .

Next, the time series V_i are adjusted for inflation using the equation (3) below

$$V_{i\ real}(t) = \frac{V_i(t)}{1 + I_c(t-1)} \quad (3)$$

where $V_{i\ real}(t)$ is the combined value adjusted for inflation in year t and I_c is the inflation of the construction sector.

Quantification of market risk

The market risk is calculated as the product of the probability and the impact of a negative effect on the results in real estate development. Therefore the yearly deviation of the segments is calculated using the equation (4) below

$$\Delta V_{i\text{real}}(t) = \frac{V_{i\text{real}}(t) - V_{i\text{real}}(t-1)}{V_{i\text{real}}(t-1)} \quad (4)$$

where $\Delta V_{i\text{real}}(t)$ is the real yearly deviation of segment I in year t.

The probability on a negative result is determined using Z-tables (Lusht, 2001). The Z-value standardizes the normal deviation. The x value in the Z calculation is 0 in this research, because the probability is calculated for $\Delta V_{i\text{real}} = 0$. Therefore Z is calculated by the equation (5) below

$$Z = \frac{|\mu|}{\sigma} \quad (5)$$

where Z represents a probability on the normal distribution of $\Delta V_{i\text{real}} < 0$, μ is the average growth of $\Delta V_{i\text{real}}$ and σ is the standard deviation of $\Delta V_{i\text{real}}$. The Z table converts the Z value in to a probability p. The Z table is based on a single-tailed distribution, thus the probability of a negative deviation determined by the equation (6) below

$$P = 1/2 - p \quad (6)$$

where P is the probability of $\Delta V_{i\text{real}} < 0$, and p is the probability determined by the Z table.

The average effect X of a negative deviation is determined by calculating the value on the x axis on the center of gravity of the negative deviation. Thus, the average effect of X equals $\frac{1}{2} P$. X is found by determining the right limitation of $\frac{1}{2} P$. The Z-table is single tailed, thus we determine the Z value for $X = \frac{1}{2} - \frac{1}{2} P$. The Z-value is used to find X. The Z-value provides the distance of X from the average μ in the number of standard deviations. Next, Z needs to be multiplied by -1, to mirror X on the Y axis. Finally average μ is added to perform the translation from the standardized

normal distribution to the actual normal distribution. The equation (7) below is derived from equation (5)

$$X = -Z\sigma + \mu \quad (7)$$

where X is the position of the average negative deviation of $\Delta V_{i\text{real}}$ on the x axis.

The market risk is calculated by multiplying the probability with the average negative effect, using the equation (8) below

$$\alpha = PX \quad (8)$$

where α represents the risk in percentages of $V_{i\text{real}}$, P is the probability on a negative effect on the result of real estate development and X is the average negative effect.

Quantifying diversification potential

The diversification potential is calculated using the Markowitz (1952) theorem. The model requires correlations, market risks and the returns on investments. No empirical data is available of the returns on investments in real estate development. Therefore the assumption is made that the real estate developer adds a risk premium on top of a return requirement. The model calculates the ratio between risk premium for market risk and the market risk. The correlations ρ_{ij} determine the correlation coefficient between segment i and j. The model calculates the average risk premium R on the portfolio using the equation (9) below

$$R_p = \sum_i X_i R_i$$

(9)

where R_p is the portfolio risk premium, X_i is the percentage of segment i in the portfolio and R_i is the risk premium of segment i.

The average market risk is calculated using equation (10)

$$\sigma_{\text{total}}^2 = \sum_i X_i^2 R_i^2 + \sum_i \sum_{j \neq i} X_i X_j \rho_{ij} \sigma_i \sigma_j \quad (10)$$

where σ_i represents the market risk of segment i .

Materials

The materials section describes what data is used for the quantitative research. First, the section describes the applied time series of the construction market. The second part describes the space market. Finally the investment market is described. All data is publically available and covers the time period of 1995 – 2009.

The construction market is described by time series of construction cost per square meter. Time series published by the Dutch central office for statistics (CBS) is used. Datasets provide the gross floor area of construction projects and the total construction price. Data is published per segment.

Time series of the space market are published by Strabo, FGH bank and the Investment Property Databank (IPD). Strabo and FGH Bank only publish data of the office and retail segment. The IPD provides data for all rental residential space as well. The transaction price data of owner occupied residential space is published by the Dutch association for the construction industry (NVB)

Time series of the investment market are published by FGH Bank and the IPD. FGH Bank only published time series of the office segment and retail segment. IPD publishes data of the rental residential segment of the investment market as well.

The time series which are used as input for the diversification model show differences based on methodology and sample. These differences cause differences in the results. Therefore four categories of combinations of time series are used for the analysis: (1) the average of all combinations of time series per

segment, (2) the most plausible time series per segment, (3) the time series based on IPD values and (4) time series which quantitatively reveal normal distributions of $\Delta V_{i \text{ real}}$.

2.2 Qualitative research method

The qualitative research answers the research question based on interviews conducted with experts.

Based on the complexity of the subject, the interviews are orally conducted using open questions. In total interviews are conducted with six experts. The selection of the experts is based on 3 factors. First, the experience of the real estate developer should near the 15 years, based on the length of the time series. Secondly, the expert should be legitimate to make decisions on the strategy of the company. This constraint is made because a diversification strategy can be implemented on both project as corporate level. Thirdly, a mix of different company categories is aspired. Three different categories can be distinguished: (1) mono disciplinary companies, (2) multi-disciplinary companies with single-use projects and (3) multi-disciplinary companies with mixed-use projects.

The qualitative research distinguishes two levels on which portfolio diversification can be applied: (1) project level and (2) corporate level.

3. RESULTS

Section 3.1 provides the quantitative results. Thereafter section 3.2 describes the qualitative results.

3.1 Quantitative results

First, the results of the quantification of market risks in real estate development are

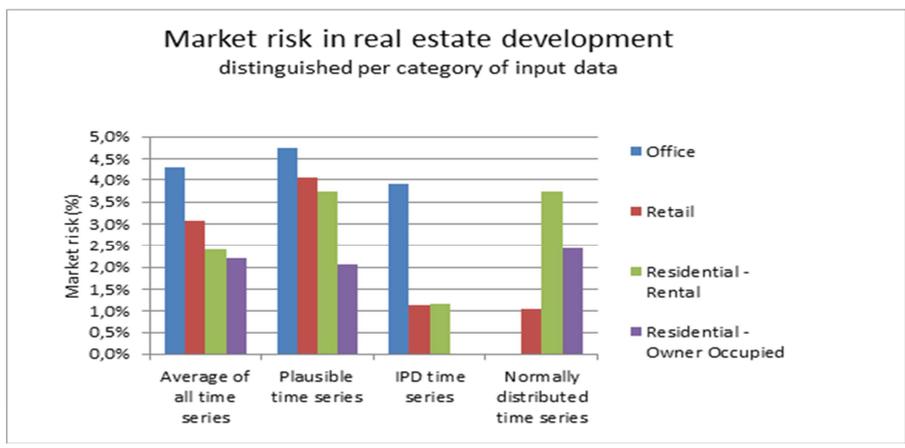


Figure 1: market risk in real estate development in percentages of the value. The averages and plausible time series show similarities on an ordinal scale. IPD time series and normally distributed time series deviate. Sources: CBS (2010), Donkers (2009), IPD (2010), NVB (2010), Strabo (2010)

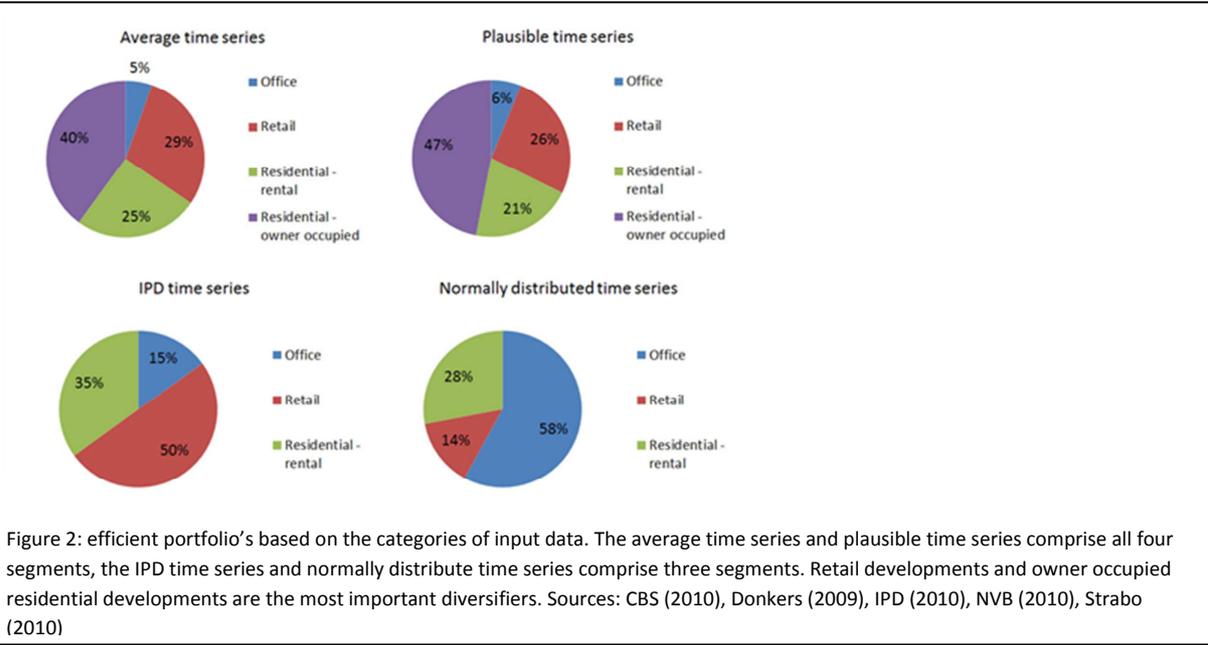


Figure 2: efficient portfolio's based on the categories of input data. The average time series and plausible time series comprise all four segments, the IPD time series and normally distribute time series comprise three segments. Retail developments and owner occupied residential developments are the most important diversifiers. Sources: CBS (2010), Donkers (2009), IPD (2010), NVB (2010), Strabo (2010)

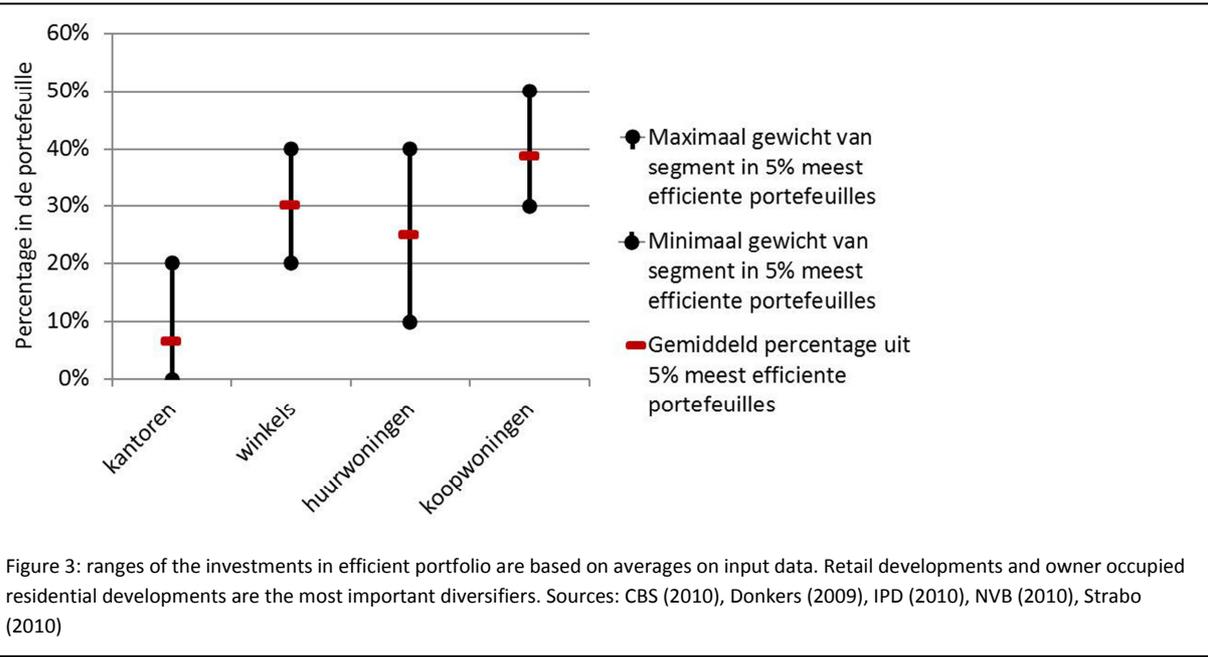


Figure 3: ranges of the investments in efficient portfolio are based on averages on input data. Retail developments and owner occupied residential developments are the most important diversifiers. Sources: CBS (2010), Donkers (2009), IPD (2010), NVB (2010), Strabo (2010)

plausible categories show similarities on an ordinal scale. The IPD time series and normally distributed time series are at variance. The IPD retail segment deviates due to the methodology of the quantification of the yields. The retail segment of the normally distributed time series deviates due to the registration of prime rents in this category. The development of office space comprises the highest percentage of market risk, followed by retail space, rental residential space and owner occupied dwellings over the last 15 years.

Portfolio diversification

The effect of a diversified development portfolio compared to non-diversified development portfolios comprises a reduction in market risks of 18 – 20%. The reduction is measured by the ratio between risk and risk premium. The average time series reveal a risk reduction of 20%. The plausible time series reveal a reduction of 18%, as well as the normally distributed time series. Time series based on IPD data reveal a reduction of 12%. This reduction is small compared to the other categories, due to the lack of data of owner occupied residential developments.

Figure 2 shows the efficient portfolio distribution of the four segments, based on the average time series. Efficient portfolios comprise on average 39% of investments in owner occupied residential developments, within a range of 30-50%, 30% in retail developments within a range of 20-40%, 25% in rental residential developments within a range of 10-40% and 6% office developments within a range of 0-20%. Figure 3 shows the ranges.

A distinction in the results is made between three-segment portfolios and four-segment portfolios. The four-asset portfolios reveal that owner occupied residential developments and retail developments are important

diversifiers. Office developments are scarcely represented in efficient development portfolios, due to high correlations with other segments. The diversifying property of owner occupied residential developments is due to low correlations with mainly retail developments. These low correlation coefficients are the result of differences in investment drivers between commercial real estate and owner occupied real estate. The three-segment portfolios both reveal the importance of retail developments. Similar to the four-segment portfolios, office developments show low diversifying capacities.

3.2 Qualitative results

The qualitative research identifies operational risk caused by portfolio diversification, and describes control measures which reduce the identified risks. The results are separated in two sections. First, section 3.2.1 describes operational risks and control measures on project level. A diversification on project level can be considered as a mixed-use development. Secondly, section 3.2.2 describes the operational risks and control measures on corporate level. A diversification on corporate level can be interpreted as a company which develops single-use real estate in multiple segments.

3.2.1 Project level

Four operational risks can be identified in project-diversification: (1) the sales risk, (2) the knowledge risk, (3) the technical risk and (4) the timing risk. The section starts with an elaboration of the four identified operational risks. Thereafter, required control measures are described.

Operational risk on project level

The salability of a development decreases when the development contains multiple functions. This sales risk comprises of two

drivers. First, the highly segmented Dutch investment market requires single-use real estate to fit in segmented portfolios. Mixed-use real estate gets less attention. The second driver arises when the building is sold in joint ownership. The development will be valued lower due to interdependency of investors.

The knowledge risk arises due to the differences between tenants. A developer should be able to communicate with different users. The lack of this competence is regarded as a risk. Thereby, the developer should be experienced in the development of the different segments.

The technical risk refers to the differences between the technical and programmatic requirements. The main complications can be found in differences between main structures and flows of people.

The timing risk is considered as the most urgent risk in the development of mixed-use real estate. Users of different segments require different development time frames. The consequence of this risk can be the loss of anchor tenants or even the cancellation of the project.

Control measures for operational risks on project level

Dealing with the identified operational risks requires control measures on both project as well as corporate level.

On project level multi-actor sessions can reduce timing risks and technical risks. Secondly the design should support a development and construction process which can be phased in accordance to the different segments.

On corporate level three measures are identified. First, developers need to be multi-disciplinary, to be able to cope with technical distinctions, and communicate with different tenants. Second, the developers should work from the point of view of the tenant. This measure enables the developer to reduce the

timing risk and the sales risk. Third, the company should specialize in mixed-use developments, to reduce the sales risk, the knowledge risk, the technical risk and the timing risk.

3.2.2 Corporate level

This section starts with the identification of two operational risks. Thereafter control measures are identified.

Operational risks on corporate level

Two operational risks can be identified: (1) the cultural risk and (2) the lean risk.

The development of real estate in different segments requires different business models and different corporate cultures. Major differences exist between owner occupied and commercial developments.

The lean risk arises due to the concept of diversification: the diversification strategy requires that the profitable segments compensate for loss-making segments. The risk arises that investment decisions will be taken less careful due to the knowledge that other segments will compensate for mistakes.

Control measures for operational risks on corporate level

The operational risks on corporate level require two measures. First, a development company is required to place different segments in different departments. This reduces the lean risk. Secondly a development company is required to specialize in its segments.

Expert opinion

The expert panel is of the opinion that diversification on corporate level does not reduce market risk. The main reason of the opinion can be found in the trend that successful Dutch real estate development companies are specialized in a single segment. The expert panel is not able to provide

examples of companies which have a diversification on corporate level.

On project level few successful examples are provided. On the scale of peripheral center areas, the combination of retail and residential space is considered as a successful product. On a larger scale, mixed-use real estate developments are considered as risk full. The diversification potential is not recognized by all experts. The provided control measures are recognized as being essential, but not applicable in all cases.

4. CONCLUSIONS

The conclusions section provides general conclusions as well as an answer on the main question.

4.1 General conclusions

General conclusions are provided for both the quantitative and the qualitative research.

The quantitative research concludes that a strategically four-segment diversified development portfolio reduces the consequences of market risk by 18 – 20%. Efficient portfolios comprise on average 39% of investments in owner occupied residential developments, within a range of 30-50%, 30% in retail developments within a range of 20-40%, 25% in rental residential developments within a range of 10-40% and 6% office developments within a range of 0-20%. Figure 3 shows the ranges.

Quantitative research reveals that a diversification generates and increases operational risks of real estate development. Diversification on project level requires control measures to be implemented on both project and corporate level. Diversification on corporate level requires control measures only on corporate level. Control measures of the different strategies conflict with each other.

4.2 Main question

The main question will be answered for the three categories of real estate developers. For the three categories the applicability of the two diversification level will be elaborated.

Mono-disciplinary developers

Diversification is an applicable tool for mono-disciplinary residential and retail developers. Both companies are required to add one or two segments. Quantitative research shows that retail and residential developments are the major diversifying segments.

On corporate level, the core business remains to be the largest department. If diversification will be applied in a mono-disciplinary company, one is required to choose between a specialization on mixed-use projects or a corporate structure with multiple departments. Applying both methods reveals contradictive control measures, and is therefore inapplicable.

Diversification is not an applicable tool to reduce the consequences of market risk for specialized office space developers. Quantitative research reveals that the volume of office space in efficient portfolios comprises only 0-10%. Thus a diversification for an office space developer results in losing scope on its core business. A diversification on project level results in business cases in which the specialized office developers are required to develop over 90% of non-office space. Major knowledge risks reveal. On a corporate level, different segments will be accommodated in different departments. Diversification leads to cultural risks and tensions within the company, because the office department should be transformed from the core business to the smallest department.

Multi-disciplinary developers with single-use projects

Based on the both the quantified diversification potential and identified risk,

this category is able to apply diversification by focusing on owner occupied residential developments, retail and rental residential space. Companies in this category are able to increase the reduction in market risk by optimizing the development portfolio corresponding to the results of the quantitative research. The operational risks can be reduced by separating the developments of different segments into strictly separated departments. The departments are required to become specialized segmented development entities. In general, development companies are too small to have enough critical mass to maintain a separated office segment department which only contains 0 – 10% of the company investments.

As long as a diversification is applied on corporate level, the development company is not able to apply diversification on a project level due to conflicting control measures between project and corporate level; the measure of multi-disciplinary employees conflicts with the strict separation of departments.

The conclusion conflicts with the opinions of the experts.

Multi-disciplinary developers with mixed-use projects

This category of developers is able to increase the reduction of consequences of market risk. On project level, the company is required to optimize the project portfolio in accordance with the results of the quantitative research: 40 – 50% of the project investments should be accountable to owner occupied residential space, 30-40% to retail and 20-30% to rental residential space. Practice reveals that the consequences of market risk can be decreased even more, if the functional program of requirements remains flexible until the start of construction. The Dutch practice reveals

two major preconditions. First, a flexible zoning plan is required. Second, the land price should be agreed on per segment, based on subsequent calculations.

On a corporate level the operational risks of this category of developers can be reduced by specializing and focusing on mixed-use real estate developments.

5. DISCUSSION

The discussion section contains three subjects. The first part discusses the differences in opinions on applicability of diversification between experts and the empirical research. Second, the validity of data is discussed. Finally, opportunities for further research are provided.

Expert opinion

The quantitative research reveals the risk reducing potentials of diversification, while current practice is partially skeptical regarding the application of the risk response method. No consensus is observed in whether or not diversification indeed reduces the consequences of risk. Consensus is observed in the operational risks originating from applying diversification on project and corporate level.

The application of diversification in the Dutch real estate development branch can be implemented on project scale. On a small scale, diversification may underpin the demand for mixed-use real estate. On a large scale, mixed-use real estate developments involve such large operational risks that the reduction in market risk may be counterbalanced. Deliberate phasing reduces operational risk majorly, and requires a design process in which the understanding of the operational feasibility is understood.

Data

Three issues regarding the data should be taken into consideration.

First, the research focuses on the Dutch markets, and aggregates the data on national scale. All quantitative results should therefore be interpreted carefully taking in mind that local market may show different trends, correlations and risks.

Second, public data of the Dutch construction market is based on the applications for construction permits. The data is based on calculations made years before the start of construction. The research ignores this time lag.

Third, the data of the retail market is scarce and promotes commercial interests. The small number of transactions made in this segment, biases the aggregated data.

Further research

Further research should be conducted on three areas: (1) on the regional aspects of the markets, (2) on the design and construction management of mixed-use real estate, and (3) on risk response methods other than diversification in the development portfolio.

This research focuses on the diversification potential based on functional segmentation of the markets. Experts reveal that the differences between regions are undeniable. The complexities arising from functional portfolio diversification may be less in regional diversification. Extensive research on differences between regional markets may reveal even larger diversification potentials.

This paper only discusses the operational risks of mixed-use real estate evolving from the differences in combining markets. Extensive research should be conducted to understand all limitations, preconditions, risks and control measures related to mixed-use real estate development in the Dutch practice.

Furthermore, diversification is one of many risk response methods regarding market risk. An overview, theoretical framework and road map of all response methods regarding market risk could be helpful for managers of real estate development companies.

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