

Management Summary

Problem introduction

The current paradoxical situation in the Amsterdam office market

The opposite figure shows the vacancy and nominal rent level development in the Amsterdam office market over the period 2001-2012. It shows that the Amsterdam office market is characterized by large fluctuations in vacancy rates in this period. Especially during the burst of the ICT-bubble (2001-2003), and in the period before and at the start of the economic recession (2007-2009), the vacancy rates increased a lot in the market. However, a 'paradoxical situation' occurred as the reported average rent levels do not demonstrate the severe price decrease one might expect, as the opposite figure indicates. In contrast, the rent levels remain relatively stable in the market. This phenomenon forms the starting point of this research.

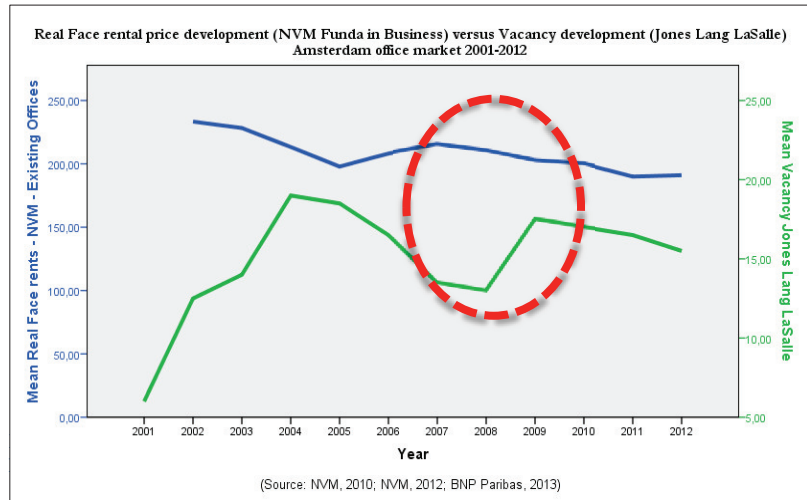


Figure 1. Vacancy (JLL) versus the average real rental price development of Existing offices (NVM) – Amsterdam office market, 2001-2012

Problem analysis

The theoretical functioning of the space market: the Four-Quadrant model

The theoretical functioning of the office rental market is schematically illustrated in the Four-Quadrant model (Wheaton and DiPasquale, 1992), of which the space/rental market quadrant is shown in figure 2. The Four-Quadrant model consists of two other market quadrants; the investment market and the construction market quadrant, with mutual interactions between the other segments by means of the continuous adjustment between demand and supply.

The space market demand curve shows that in a well-functioning space market, when the demand increases, the real effective rent level should decrease in the market, and vice versa.

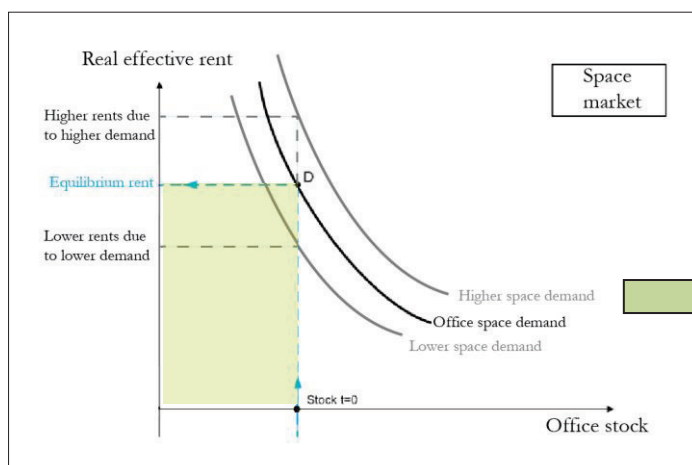


Figure 2 . Space market quadrant of Four-Quadrant model (DiPasquale and Wheaton, 1992); modified by Koppels and Soeters (2008)

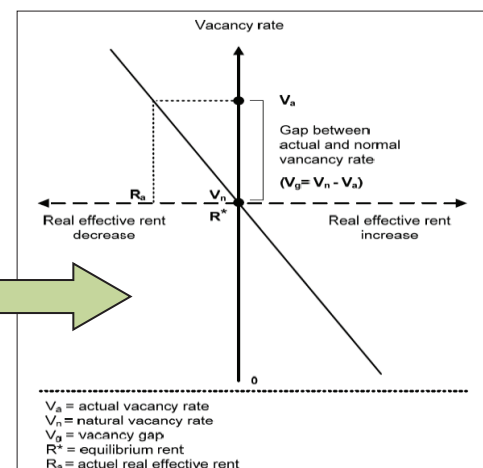


Figure 3. Rental Adjustment Equation (Hendershott, 2004); schematically illustrated by Koppels & Keeris (2006)

The supply curve reflects that in the short term, supply is inelastic or unable to anticipate demand. When the demand for office space changes, the equilibrium rent will adjust quickly in the short-term in order to balance demand and supply, which results in under- or overshooting. In the long run however, supply is capable to adjust to market

demand. Hence office rents will likely recover to their long run level, counterbalancing the short term overshooting. This results in dynamics in the development of office rents.

The theoretical relation between vacancy and real effective rent levels

The vacancy rate is an indicator of the prevailing market conditions. The relation between vacancy and the real effective rent level is based on the so-called ‘rental adjustment equation’ (Hendershott, 2004):

$$\frac{(R_t - R_{t-1})}{R_{t-1}} = \lambda (V_n - V_a) \Rightarrow \Delta R = \lambda (V_n - V_a) \quad (\text{Hendershott, 2004})$$

R = Real rent; V_n = natural vacancy rate; V_a = actual vacancy rate; λ = adjustment factor

The rental adjustment equation shows a *linear* relationship between the actual vacancy rate and the real effective rent level, which is schematically displayed in figure 3 by Koppels & Keeris (2006).

This mutual relation with the real effective rent level indicates that in a well-functioning market; when the vacancy rate increases (compared to the natural or long-term vacancy rate); for instance due to an economic decline; normally leads to a downward price-pressure and lower (real effective) average office rent levels, and vice versa.

The main reasons behind the current paradoxical situation

The current ‘paradoxical situation’ can be explained by two main market imperfections:

1. Segmented/sub-market behavior of office markets; the scale of the analysis might not reflect the actual market process.
2. Reasons related to the in-transparency or asymmetric information availability in the Amsterdam office market:
 - a. Published *face* rental prices in the market
 - b. Reported vacancy rates might not reflect the prevailing space market conditions

The reasons mentioned will be explained in depth in the following paragraphs:

Reason 1: Segmented/sub-market behaviour of office markets

The first reason for the paradoxical situation is that the scale of the analysis might not reflect the actual market process. Real estate markets are characterised by its spatial and structural segmented structure, due to their (interrelated) sub-market behaviour and the heterogeneity of its assets. However, most studies model the market as a whole, thereby ignoring the segmented structure. (Stevenson, 2007).

Different market trends might occur per market segment, which is illustrated in the opposite figure. As a result, the relation between the rental prices and the vacancy rate in the market might differ per scale level (for instance differences in relation with a national level, compared to a city-wide or city sub-market levels) in the market. However, there is no unambiguous answer on which scale level is the most appropriate scale level for evaluating the relation between both variables.

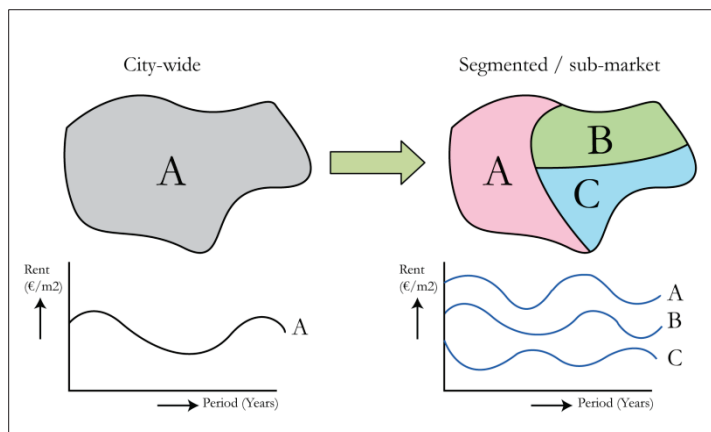


Figure 4. Spatial segmentation/sub-market behavior of office markets: different market trends per market segment (example: rent development)

Reason 2: In-transparency or asymmetric information availability in the Amsterdam office market

The other reasons behind the current paradoxical situation are related to the in-transparency or asymmetric information availability in the Amsterdam office market. In a fully transparent market, all parties have access to the same information. In the (Dutch) real estate market information is asymmetric distributed, as some information is only available to a small number of parties.

2a. Published face rental prices in the market

One of the **causes** of the current in-transparency in the Amsterdam office market, is due to the provision of so-called *lease incentives* (*any factor apart from the contract rent and general asset quality, the enables or motivates a particular housing decision*' (Harding 2012)), by landlords instead of adjusting the long-term rental rate. The most common lease incentives in the Netherlands are one or more rent-free period(s), rental discount(s) or a contribution to the furnishing costs.

The main purpose of providing incentives is to simplify the negotiations between the tenant and the property owner.

In addition, investors try to prevent their investments against fluctuations, as this negatively influences the value and the predictability of the asset. Incentives are used as *rent fluctuation buffer*, which is illustrated in figure 5. Instead of a downward price adjustment of the contract rents (*"the gross yearly rent (in € per m² LFA per year), which is contractually agreed to be paid, without [lease] incentive correction"* (van Gool, 2011)), landlords react on negative market circumstances by providing incentives without adjusting the long-term rental rate. As a consequence, the incentives are adjusted to the long-term rental price, which results in a rental price level which stays on a certain equilibrium, despite of changing market circumstances.

The use of this method requires investors to keep the amount of provided incentives privately, as publicly shared might cancel out the advantages of the incentive buffer. As a result, public lease incentive information is very scarce and qualified as being sensitive and confidential information. (Harding, 2012)

As published or reported market rental prices by real estate agents are expressed by the combination of a rental price with a rental incentive, they create a distorted picture of the rental price development in the market. The published rent levels are known as the so-called *asked* or *face* rent levels, which are illustrated by the [blue line](#) in the opposite figure.

The combination of the provision of lease incentives by landlords, instead of adjusting their long-term rental rate; and the published face rental prices in the market, might explain the stable face rental price development in the market the last years.

However, the true underlying *effective rental price* (*"the contract rent yearly paid, corrected for [lease] incentives (in € per m² LFA per year)"* (van Gool, 2011)) development might differ from the published face rental prices and development in the market. This is illustrated by the [green line](#) in figure 6, which represents the underlying effective rental price development.

As a result, the relation with the vacancy rate in the market, might change when the vacancy rate is compared with the (real) effective rental price development in the market.

2b. Reported vacancy might not reflect the prevailing space market condition

Another reason for the paradoxical situation, is that the reported vacancy levels might not accurately reflect the prevailing space market condition, because figure 3. is distorted due to inclusion of obsolete office space. Vacancy in obsolete buildings might not lead to a downward price pressure on the office space market, because it is not considered a viable accommodation alternative by office space users. This is indicated by research of Koppels & Keeris (2006), which showed a stronger correlation between the rental price development and the vacancy rate, when the structural components of the vacancy rate were left out of the equation.

Other consequences of the in-transparency of the Dutch and Amsterdam office market

As almost all parties in the current real estate market provide incentives nowadays, the current situation seems to be a self-sustaining system: market conformity is expressed by a rental price in combination with a rental incentive

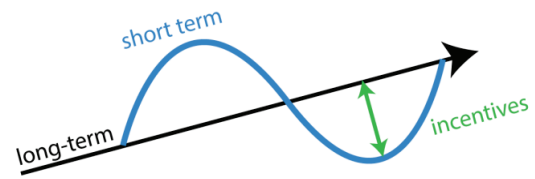


Figure 5. Incentives as rent fluctuation buffer; when the market rent level is below its long-run market rent

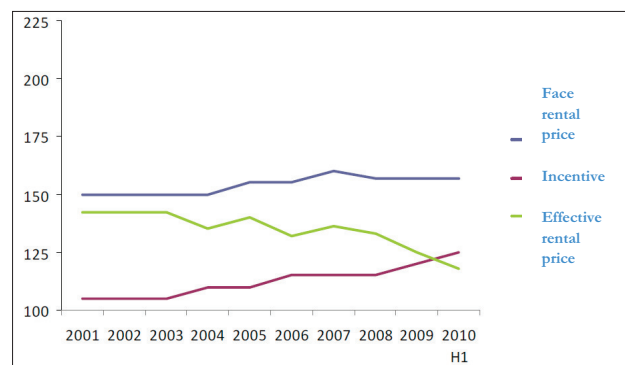


Figure 6. Schematic: underlying incentive and effective rental price development (Swagerman, 2010)

(Swagerman, 2010; van Gool, 2011). As the face rental prices remain relatively stable, *fluctuations* in the underlying incentive development currently dictate the underlying effective rental price development in the Amsterdam office market. This is illustrated by the [purple line](#) in figure 6.

The lack of information, especially due to the published face rental prices, can function as a barrier for entrants, outsiders and non-experienced participants in the market, for instance for international investors who are becoming more important in the Dutch real estate market nowadays. Accurate and reliable market data and price signals are important for a well-functioning and competitive real estate market, as they serve as input for real estate investments, for marking a well-considered value decision, for market analysis, etc. In contrast, the real estate industry has created a system with a lack of transparency, in which uninformed parties *can* be disadvantaged.

The current in-transparency, especially due to the published face rental prices has important research implications. Because real estate advisory firms and research institutes use published asked/face rental prices and contract rental prices for their publications or research - instead of effective rental prices – the outcomes provide an improper reflection of the current and historic real estate market development.

The overall market development based on face rents or contract rents including incentives might differ from the actual underlying development of the market, based on effective rent levels, which are excluded from incentives.

As data about incentives and effective rent levels are rather private, quantitative research about incentives and effective rent levels is hardly done. However, reliable research into the working of the real estate market is important to provide a clear market overview which is available for all actors in a competitive market, but also for policy and planning decisions for both public and private parties.

Problem definition

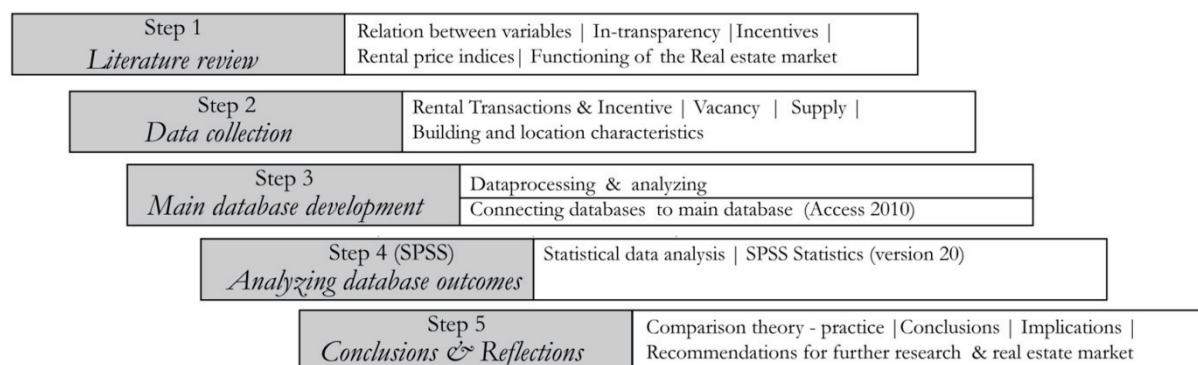
Research questions

The problem analysis has led to the following main research questions:

1. “To what extent does a price index based on face rents, provide an accurate reflection of the market dynamics in the Amsterdam Office market over the period 2002 – 2012?”
2. “Do spatial market segments differentiate in market dynamics in the Amsterdam office market over the period 2002-2012?”

Research aim

1. Set the next step in ‘solving’ the transparency problem in the Dutch real estate market, by giving openness about the underlying effective rental price and incentive development in the Amsterdam office (sub-)market(s), in order to make the office market more accessible and competitive for outsiders, entrants and non-experienced participants in the market
2. Constructing a ‘(real) effective rental price index’ in order to provide an as market conform reflection of the market dynamics in the Amsterdam office market over the period 2002-2012



Approach and methodology

Approach explained: data overview and data mining process

The figure above shows the approach followed during this research. The first two steps are self-explaining. During the third step the reliability of several data sources (which are shown in figure 8 on the next page) are analyzed. This

is followed by the development of a ‘main’ database from several individual data sources/databases. The individual databases are connected to the BAG (Basic registration of addresses and buildings in the Netherlands), by means of their address, place and postal code. This is followed by connecting the BAG database to the Total office stock database of the Delft University of Technology. This is a database of all *office buildings* in Amsterdam, including several building and location characteristics. This eventually results in one database with *listed* transactions, building and location characteristics *per office building* in Amsterdam, as shown in the figure below.

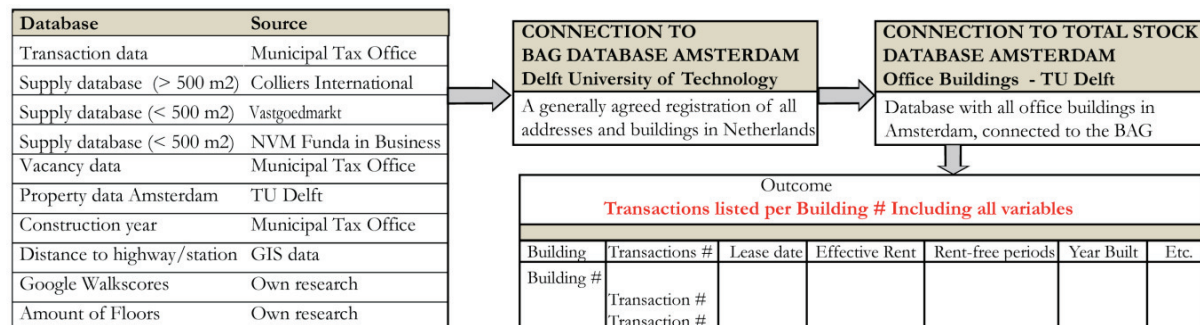


Figure 8. Overview data sources used in research & data mining process

In the fourth step, the statistical analysis is performed, which is divided in five individual studies, which are shown in the figures below. Per figure is mentioned which *method* is used. The methods are individually discussed in the second section (Part II- Problem definition) of this report.

In the final fifth step, the research questions are answered, the hypotheses are evaluated and the researched is reflected.

Transaction data validation

In this research, the transaction data will be used from the Municipal Tax. In order to determine the yearly WOZ-value (Valuation of Immovable Property Act) of a specific property, the DBGA sends out a rental questionnaire to all the (tenants related to the) transactions of the past year, in which they ask for a rental contract and/or the filled in questionnaire. From all the

sent rental questionnaires they receive about 50-60% response, in which about 50% from the sent questionnaires also adds the rental contract. In this rental questionnaire the most important aspects of the transaction are requested, in order to give an as accurate possible assessment about the market conformity of the particular transaction. As a result, not only the start rental price, but also all type of incentives (rental discounts, rent-free periods, investments by the tenant/landlord) are requested.

This research uses only *accepted* market conform transactions of the Municipal Tax Office. The most important reasons for rejecting a transaction are based on the following main reasons: 1. *Improbable sale or rental price*; 2. *Family transaction or 'possible' family transaction*; 3. *Multiple disciplines in rent*; 4. *Objects which are out of use*; (5. *Only a parking lot is rented*).

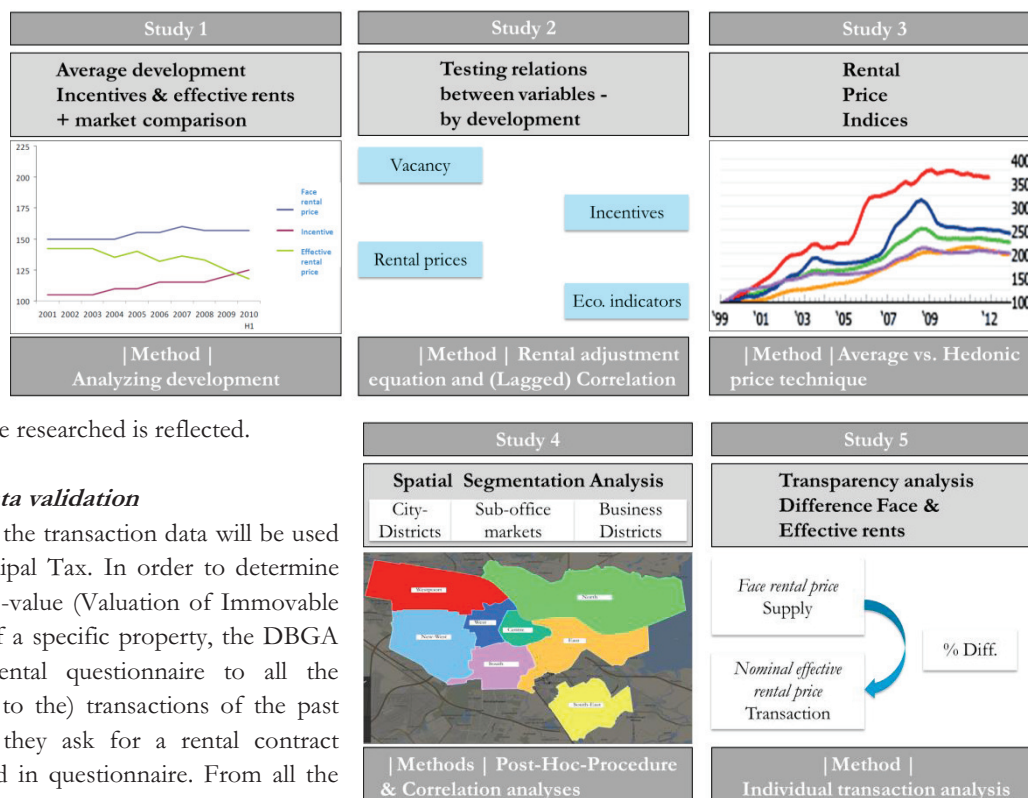


Figure 9. Approach step 4: Overview sub-studies

Calculating the effective rental price per transaction: DCF method

In this research the effective rental price is calculated per transaction, in which the initial contract rental price is corrected for parking lots and incentives.

In the calculations there is only corrected for two types of incentives, namely:

- Rent-free periods (in months/years)
- Rental discounts (in Euros)

in which there is assumed that all incentives are provided at the beginning of the contract term. In addition, there is assumed that investments by the landlord are already incorporated in the contract rent. Investments by the tenant are not taken into account, as there is assumed that the rental price is already negotiated after discussing the investments by the tenant. Furthermore, it is too difficult to make an accurate correction about the influence of investments by the tenant on the rental price.

The effective rental price ($t=0$) per transaction is calculated by means of the *Discounted-Cash-Flow* technique.

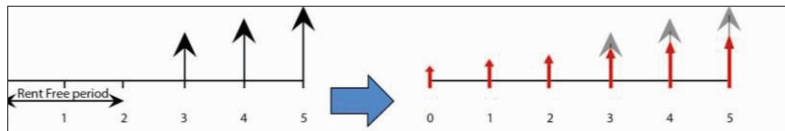


Figure 10. Rent free periods discounted over the entire lease period

In a DCF calculation the future gross rental income is discounted to the present. In case of incentives, the incentives are discounted over the entire lease period, as shown in figure 10.

An Excel-Cash-Flow-template is developed, which calculates the percentage incentives and the effective rental price / m² ($t=0$) per contract term, for each individual transaction.

In the DCF calculations, the Net Present Value (NPV) of the nominal contract rent including incentives (orange) is the same as the NPV of the effective rent calculated (dark blue). The light blue bars represent the contract rent excluding incentives. The amount of incentives is calculated as percentage difference between the NPV of the contract rent excluding and including incentives.

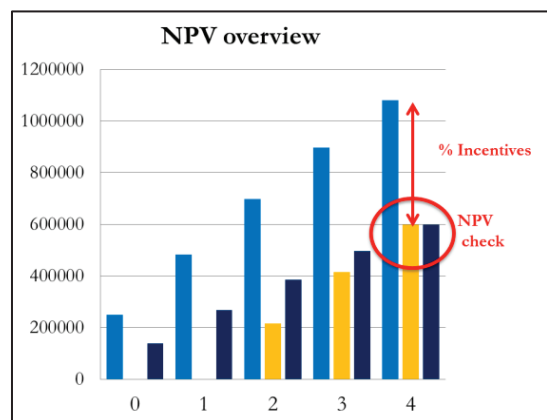


Figure 11. NPV check and % Incentives calculated per transaction

Explanations by literature

Market dynamic: cyclical behavior

The real estate market and especially the office market can be described as a cyclical market, in which supply, demand, prices and returns vary around their long term trend. The cyclical behavior of the office market gives inside in the functioning of the real estate market and the interaction with the broader economy. The opposite figure shows the different periods of the office market cycle, namely *recession*, *recovery*, *expansion* and *contraction*, per moment of the cycle (Theebe, 2013).

Figure 13. shows a typical phenomenon of the office market, namely the lag between demand and supply, in which the supply cycle is following the demand cycle. The vacancy rate is used as an indicator of the specific cycle position.

According to Witten (1987), it is important to realize that office markets are local markets, subject to local influences, in which office markets in different regions have local cycles. Research of Mueller (1995) showed that submarkets can move differently from the overall market cycle in the short run, but submarkets will typically trend with overall market movements in the long run. According to Hordijk (2005) the office market is the market with the most pronounced cycle,

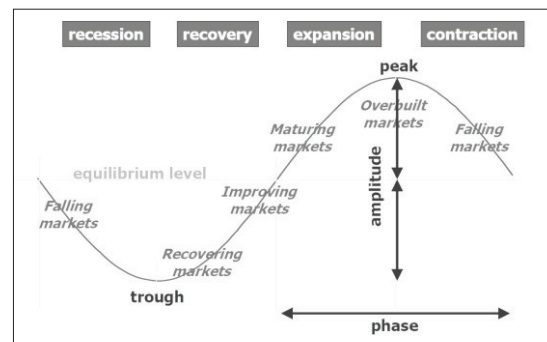


Figure 12 . The office market cycle (Theebe, 2013)

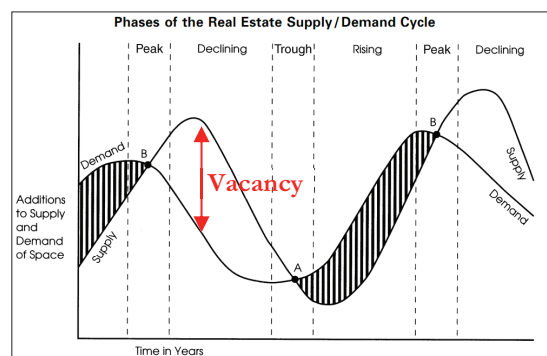


Figure 13. Demand/Supply curve (Phyrr, et al., 1999)

since office employment growth and economic growth are assumed to be closely linked.

The segmented and sub-office market behavior of office markets

As explained in the problem analysis, the real estate market is characterized by its segmented structure. According to Stevenson (2007) segmentation of the real estate market, can consist of two types: spatial segmentation and structural segmentation. Spatial segmentation is related to locational features, while structural segmentation is based on differences in property specific aspects.

Most office markets are modeled or described per country or city as a whole. As a result, the segmented structure of office markets is thereby ignored. Stevenson (2007) tested the interrelated rental adjustment process between four submarkets in the London office market. The outcomes showed several differences in characteristics between them, with one sub-market functioning as the prime submarket in London.

Research of Hanink (1996) showed that the regional office vacancy effect on rent levels is stronger than the national office vacancy effect in both downtown and sub-urban office markets. Jones (1995) implies that the sub-urban office market would be the most appropriate level for analyzing office market dynamics.

Research into sub-market behavior in the Netherlands is mostly done by Brounen and Jennen (2009, 2009a, 2009b). They found that clustering offices results in higher rents in the Amsterdam office markets, regardless of the prevailing economic conditions. They also described that office rents vary significantly across submarkets, with Amsterdam Centre and Amsterdam South as the most expensive markets.

The relation between vacancy and rent levels

Research of Koppels and Keeris (2006) showed a *two-year time-lag* between the *vacancy rates* and *rent adjustments*, which confirmed their hypothesis that landlords are reluctant to adjust their rental rates when there are fluctuations in the vacancy rate. In the same research another hypothesis was tested that *incentives are used for short-time price adjustments* and therefore should correlate with the vacancy rate without any time-lag. The *correlation analysis showed a strong correlation with the vacancy rate without a time-lag*. However, the rent levels used were not fully corrected for incentives. Their research therefore distorts the relation between both variables. Another hypothesis tested in this research was: real rent levels adjusted for incentives have a stronger relation with the vacancy rate then a non-adjusted rent level has. Due to insignificant outcomes and data there was no clear-cut answer possible to confirm or reject this hypothesis.

Research of Brounen and Jennen (2009a,b) showed that rents adjust to short-run changes in the economy. Their research also showed that second tier office markets show the same cyclical vacancy pattern as their related premier office markets, only less volatile. In contrast to Hendershott et al. (2009); Brounen and Jennen 2009b concluded that rental adjustments in the office markets are asymmetrical.

Research of Remøy (2010) showed that structural vacant offices do not have the building or location qualities to compete within a supply shocked market. This is in line with research of Koppels & Keeris (2006), which showed that the correlation between vacancy and real effective rents is higher when the structural components of vacancy are left out of the equation.

Rental price indices

Rental price indices can be distinguished by three main aspects, namely by *technique*, by *type of rents* and by *inflation correction*, as shown in the figure 14. The figure also shows the expected improved market realistic situation between each type of technique, type of rents or inflation correction.

The most important distinction in *technique* is based on a so-called quality adjustment, in which the

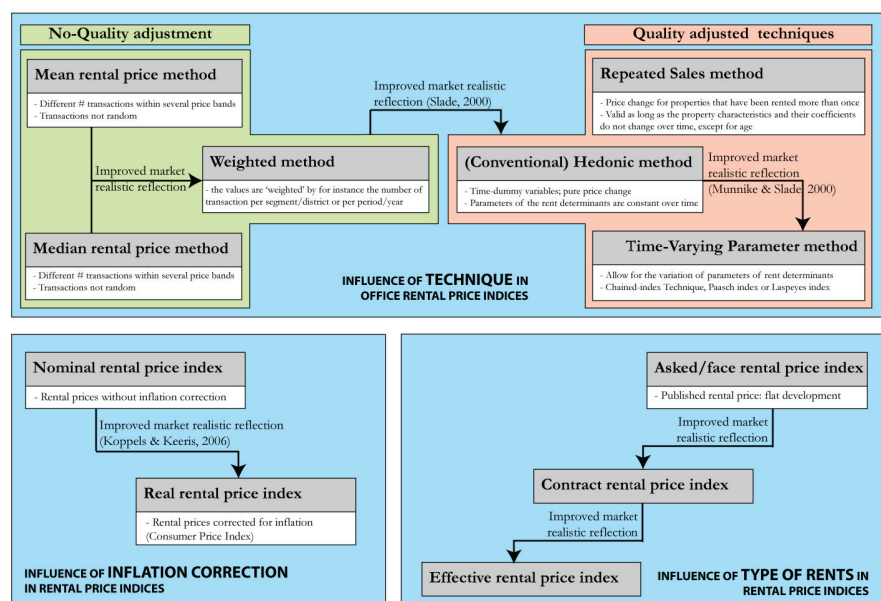


Figure 14. Different types of rental price indices

average rental price index is corrected for location and building characteristics over time.

This research compares the average rental price index technique with the time-dummy hedonic rental price index technique. The above figure indicates that the *real effective quality-adjusted rental price index* should provide the most realistic reflection of the market developments in the Amsterdam office market.

Empirical research

Data overview

The total transaction database of the Municipal Tax Office consists of 4413 office transactions in the period 2002-2012. In this research only accepted transactions (2957) by the Municipal Tax Office are used, which consists of about two-third (67%) of the total database.

From all the accepted transactions (2957), there are 2535 transactions with an 'available' Lettable Floor Area by the Municipal Tax Office.

From these available transactions with a lettable floor area, there are 464 transactions with a lettable floor area higher than 500 m², which are most common for analyzing the commercial real estate market. Most theories and market reports about the global and national real estate/office market, are almost all related to the real estate/office market for transactions with an LFA > 500 m². This study also researches the market segment below 500 m², which is often ignored and less researched.

Contract Year	Count	Transactions LFA < 500 m ²	Transactions LFA > 500 m ²	Transactions with a known LFA
2002	378	247	53	300
2003	315	213	45	258
2004	342	231	43	274
2005	269	194	39	233
2006	325	239	53	292
2007	341	227	67	294
2008	288	189	50	239
2009	228	167	34	201
2010	187	142	30	172
2011	157	113	32	145
2012	127	109	18	127
Total #	2957	2071	464	2535

Study 1: Average incentive and effective rental price development in the Amsterdam office market

Incentives in the Amsterdam office market

The frequency analysis (not displayed) indicates that incentives are becoming generally acceptable and used in the Amsterdam Office market nowadays, as the ratio incentive transactions-total transactions in the researched database, has grown from 9% in 2002, till almost 45% in 2011 and 2012.

Average incentive development

Figure 15. shows an *upward-cyclical incentive development* in the Amsterdam office market over the period 2002-2012 for transactions with an LFA > 500 m², from around 2% in 2002 till 15% of the contract rental price in 2012.

The high incentives the last years led to a large gap between contract and effective rental prices. The incentive development shows that incentives are provided at different moments of the cycle. The incentive development for transactions below 500 m² also increases in the market the last years, till 3-4% in 2011-2012.

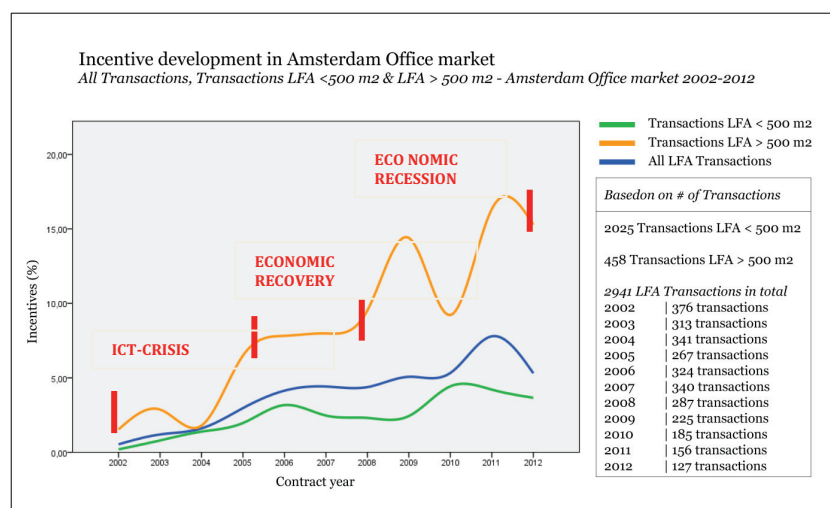


Figure 15. Incentive development in Amsterdam office market

The real effective rental price development

Figure 16. shows the real effective rental price development (orange and green) in the Amsterdam office market, compared with the real GDP Growth (blue bars), several important economic and market events (yellow) and the overall division in economic periods (van Eijk, 2012; dark grey).

The effective rental price *development* for transactions with an LFA below and above 500 m2, is really similar. One contradiction exists in the development of both rent levels, namely in the period 2003-2005. In this period the rental prices of larger transactions declined, while the rental prices of smaller transactions increased in the market. This might be explained by the so-called ‘hog-cycle’ (Dutch: varkenscyclus), which occurred in the market in this period, due to the rising supply and decreasing demand. As a result, investors had to decrease their rent level in order to attract tenants. It might have occurred

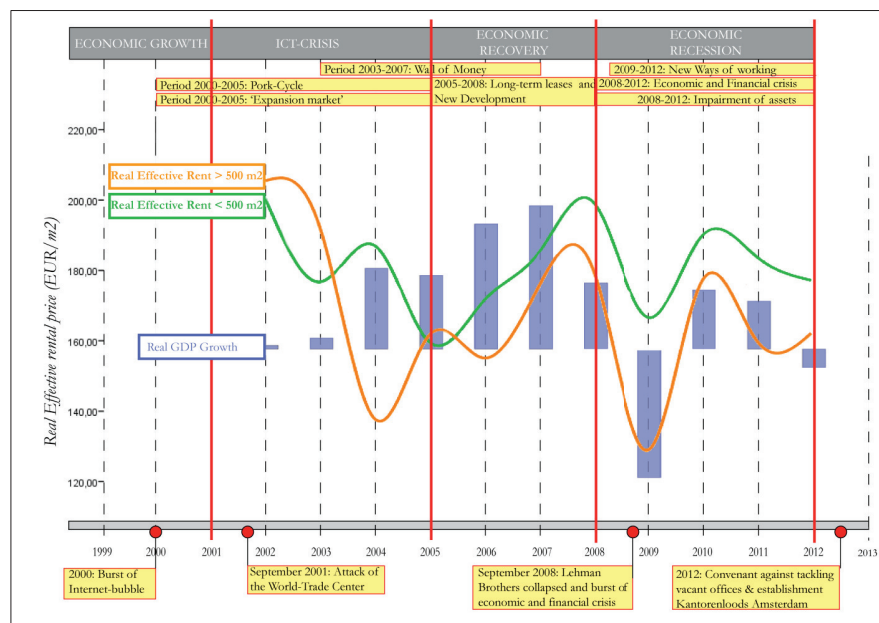


Figure 16. Average real effective rental price development in the Amsterdam office market

that this influence was stronger for larger offices compared to smaller offices.

Overall the effective rent development is divided in three main periods; a strong decline in prices during the ICT crisis; a rise in prices during the period of economic recovery and a strong decline followed by a strong recovery during the period of recession.

Face rental price comparison market reports

The comparison between the face rental price development published in market reports (NVM Funda in Business, Bak; LFA > 500 m2) with the underlying contract and effective rental price development of this research, showed that the contract or effective rental prices are on average 15-23% lower compared to the face rental price development.

However, the *development* itself is comparable between the face rental price development and the contract or effective rental price development.

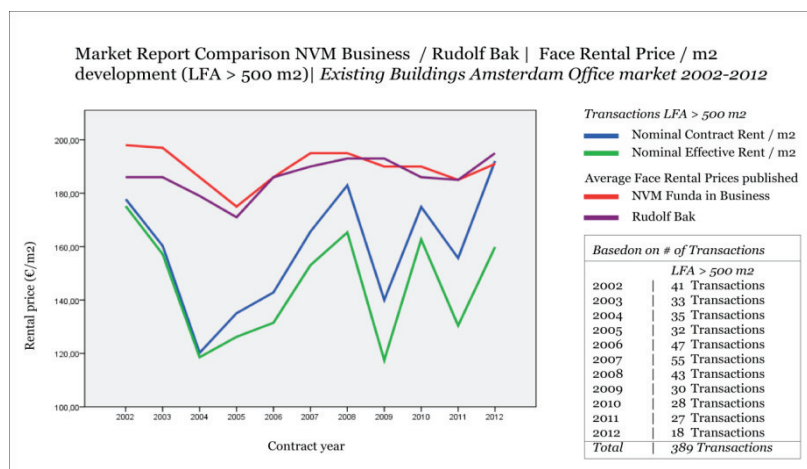


Figure 17. Face rental price comparison market report NVM Funda in Business

This is confirmed by the significant correlation between the face rental price and the contract or effective rental price development. In contrast there are no significant correlations with published *prime* face rental prices in the market.

Study 2: Average vs. Hedonic rental price indices

The second study compares the average (‘mean’) rental price index technique with the hedonic rental price index technique, between contract and effective rental prices. The literature review showed that the hedonic rental price index technique should be more market realistic compared to an average rental price index technique. Both rental price indices show a really cyclical behavior in rental prices in the market (figure 19), in which both rental price index techniques show a more or less similar ‘overall’ development.

		Contract rents / m2 - Existing offices – LFA > 500 m2	Effective rents / m2 - Existing offices – LFA > 500 m2
NVM Face rents – Existing Offices	Pearson Corr.	,628*	,723*
	Sig. (2-tailed)	,038	,012
Bak – Face rents Existing Offices	Pearson Corr.	,647*	,421
	Sig. (2-tailed)	,031	,197
Prime Face rents	Pearson Corr.	,539	,311
BNP Paribas	Sig. (2-tailed)	,087	,353

Two contradictions exist between both real effective rental price developments, namely in the period 2003-2005 and in the period 2010-2012. In the latter period, the real effective rental price development in the 'average' rental price index is rather stable, while the 'hedonic' real effective rental price shows a decline and recovery in rental prices in this period. In the period 2006-2008, the 'hedonic' real effective rental price index shows a small lag compared with the 'average' rental price index based.

The average rental price index shows large deviation between real contract and real effective rental prices in 2011 and 2012; while the hedonic rental price index shows a large deviation in 2010 and 2011.

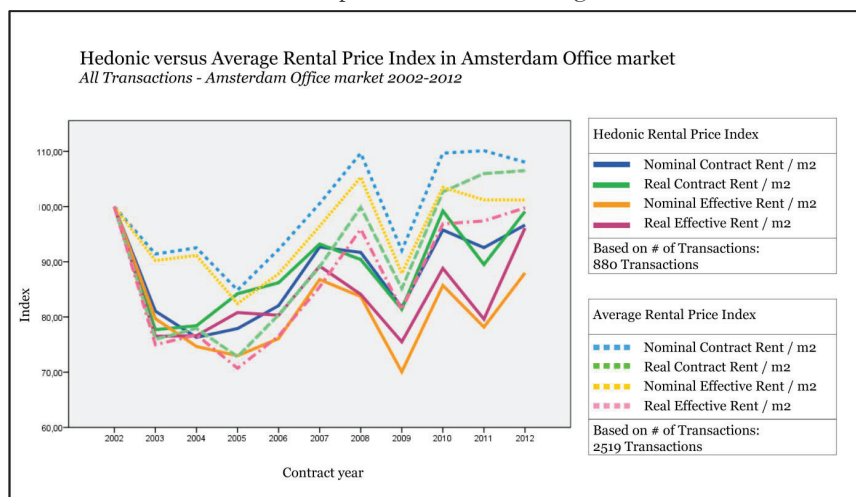


Figure 18. Average vs. Hedonic rental price indices

The largest limitation of the hedonic rental price index technique in this research, is the small (adjusted) R-Square, which is around 0,3; which indicates that the independent variables (building and location characteristics; yearly time-dummies; and location dummies) in the model account for 30% of the variation in the dependent variable (rent levels). The remaining 70% of the variation might be explained by other variables which influence the dependent variable. In comparable hedonic rental price indices, similar independent variables account for 70-90% of the total variance in the dependent variable, which should lead to a more accurate reflection of the overall market developments.

Study 3: Testing relations between variables: Vacancy vs. Incentives and Rents

This paragraph compares the incentive and rental price development in the Amsterdam office with the vacancy rates published in the market. As different vacancy rates are published in the market, an *average vacancy rate* is constructed from all the individual vacancy rates, for this research.

In addition, as market reports only report vacancy rates of offices in Amsterdam with an LFA > 500 m2, the vacancy rates are only compared to the incentive and rent level development of transactions with an LFA > 500 m2.

Vacancy vs. Rental price

This research showed a stronger correlation of the vacancy rate with effective rent levels in the market compared to contract rent levels. In addition, the correlation between 'real' rent levels and the vacancy rate is higher than 'nominal' rent levels and the vacancy rate, which is in accordance with earlier research of Koppels & Keeris (2006).

The *real face rental price* showed to be a significant indicator of the rental adjustments in the

		Real face rents / m2			Real contract rent / m2			Real effective rent / m2		
		No-time lag	lag 1 year	lag 2 years	No-time lag	lag 1 year	lag 2 years	No-time lag	lag 1 year	lag 2 years
Average vacancy rate market reports	Pearson Sig. (2-tailed)	-,765**	-,698*	-,396	-,570	-,262	,405	-,751**	-,557	,047
	N	,006	,017	,258	,067	,436	,246	,008	,075	,898
		11	11	10	11	11	10	11	11	10

Amsterdam office market, due to high correlation with the average vacancy rate.

In addition, the correlation between the contract or effective rental price and the average vacancy rate, showed that the *real effective rent level* is also a significant indicator for rental price adjustments in the Amsterdam office market due to the stronger mutual correlation, compared to contract rental prices. This is in line with the rental adjustment equation (Hendershott, 2004).

Based on # of Transactions: 880 Transactions	
Nominal Contract Rent / m2	
R Square	Adjusted R Square
0,313	0,293
Real Contract Rent / m2	
R Square	Adjusted R Square
0,348	0,316
Nominal Effective Rent / m2	
R Square	Adjusted R Square
0,317	0,297
Real Effective Rent / m2	
R Square	Adjusted R Square
0,364	0,333

Figure 19. R-Square per rent level

The relation between vacancy and the rental price shows the highest correlation without a time-lag in each rent level. This is in contrary to earlier research of Koppels and Keeris in 2006, which found a two-year time-lag between the vacancy rates and rent adjustments. Their explanation for this behavior was that landlords are reluctant to adjust their rental rates when there are fluctuations in the vacancy rate.

Vacancy vs. Incentives

The incentive development is significant positively correlated with the vacancy rate in the market, in which the relation with the percentage incentives is the strongest with a two-year lagged vacancy rate, in each vacancy rate researched. This is in contrast to research of Koppels and Keeris (2006), which indicated that incentives are used for short-time price adjustments and therefore should correlate with the vacancy rate without any time-lag. In contrary to my results, they found a strong correlation between incentives and the vacancy rate without any time-lag.

		Percentage incentives		
		No-time lag	lag 1 year	lag 2 years
Average vacancy rate market reports	Pearson Correlation	,523	,678*	,714*
	Sig. (2-tailed)	,098	,022	,020
	N	11	11	10

Study 4: Spatial segmentation analysis

The spatial segmentation analysis is divided in two main researches, namely an analysis of the incentive and the nominal effective rental price development per city-district, sub-office market and business-district.

Incentive analysis – spatial segmentation

The height of incentives differs per city-district, sub-office market and business district the last years. However, a correlation analysis showed that the *development* of incentives over the entire period is very similar per city-district and sub-office markets.

In general, the incentives in Amsterdam South(-Axis), Amsterdam West and Amsterdam South-East are most of the time significantly higher compared to other city-districts or sub-office markets.

The correlation analysis per business district showed that the incentive development is (more or less) similar for each other in the surrounding areas. For instance, the incentives in the three business districts located in the Centre of Amsterdam are all (significantly) mutually correlated. Furthermore, the incentive development in Amsterdam Teleport and the surrounding Sloterdijk Business district are also (significantly) mutually correlated.

This research also showed that the incentive development in the most important business district in Amsterdam, the South-Axis, WTC, RAI district significantly correlates with other important business districts, namely Teleport, Arena/Bijlmerplein and the Canal District area.

Real effective rental price analysis – spatial segmentation

The effective rental price analysis showed that the rental price levels significantly differ per city-district, per sub-office market and per business district in Amsterdam the last 10 years. The correlation analysis showed - in contrast to the incentive analysis – only some significant correlations in development between city-districts, sub-office markets and business districts in real effective rental price development. The real effective rental price correlation analysis indicates that spatial market segments mostly differ in market dynamics in the Amsterdam office market over the period 2002-2012. In line with the incentive analysis, the business district analysis showed that the three surrounding business districts in City-District South-East are all significantly correlated.

In line with research of Brounen and Jennen (2009), the rental price level in Amsterdam South-Axis, WTC, RAI; the Vondelpark and the Canal district are significantly higher compared to the other business districts, in which the difference between the South-Axis and the other districts is growing the last years.

Study 5: Transparency analysis; difference between face and effective rental prices

The ‘transparency’ analysis compares individual face rental prices when an office is for rent, and the effective rental price at the moment of the transaction. The supply databases of Colliers International and the (online) supply database of the Vastgoedmarkt are used for the comparison (LFA > 500 m²).

From the 458 transactions with an LFA above 500m²; 238 transactions were initially connected with an associated face rental price in the market. While connecting the face rental prices with the effective rent transactions, one major implications made it difficult to make an accurate comparison of the difference in rental price per transaction:

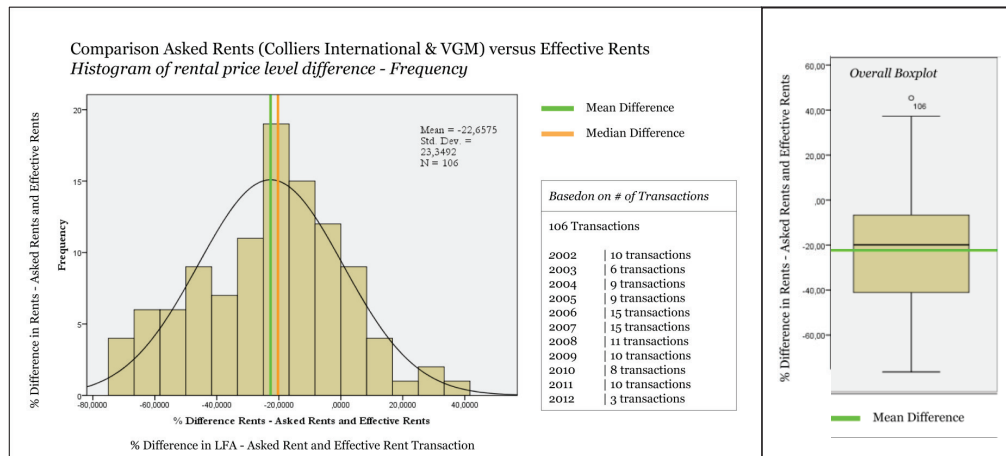
- Most of the time more square meters were available for rent, but only a small amount is rented by the tenant, which most of the time changes the height of the rent level. The other way around also occurred, with less square meter for rent; compared to higher square meters rented at the moment of the transaction.

In order to provide an accurate conclusion about the overall difference between face rental prices and effective rental prices in the market, the following transactions are deleted from the sample:

- LFA (m2) of Transaction Rent $\geq 25\%$ LFA (m2) of Face Rent
- LFA (m2) of Transaction Rent $\leq 100\%$ LFA (m2) of Face Rent

As a result, more than 50% of the associated transactions are deleted from the sample and only 106 accurate transactions are left in the final sample. From these 106 transactions there can be assumed that the effective rental price of the transaction corresponds with the face rental price on the market.

The results of the 106 transactions show that the difference between face rental prices and effective rental prices is on average around 20 per cent in the sample. The median and mean of the difference between asked



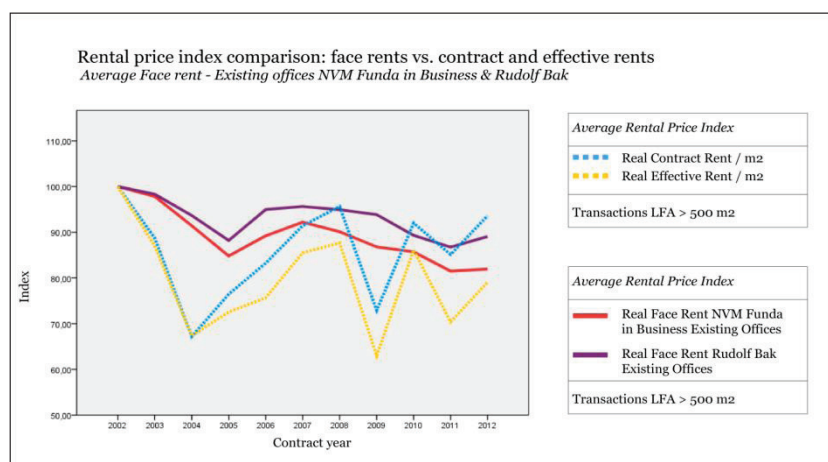
rental prices and effective rental prices do not really differ from each other. The overall box plot indicates that 50% of all the values are between a 5% difference and a 40% difference in rental prices. The results provide an *indication* of the overall difference between the face rental prices and the effective rental prices in the Amsterdam office market, but the amount of connected transactions is too small in order to provide an accurate conclusion.

Conclusions

1. "To what extend does a price index based on face rents, provide an accurate reflection of the market dynamics in the Amsterdam Office market over the period 2002 – 2012?"

The literature review showed that an effective rental price index should provide a more market realistic reflection, compared to a rental price index based on face rents. This is more or less proved in this research due to the following reasons:

1. The comparison between the face and effective rental price development in the Amsterdam office market showed that the average effective rental price development is about 23% lower compared to the face rental price development for existing offices. This is in line with the individual transaction analysis which showed an average difference of 20% between both rental prices.



In contrast, the correlation analysis showed that the *development* itself is comparable, due to the significant correlation between the face rental price development and the contract or effective rental price development. In contrast, the comparison with the *prime* rental

price development showed no significant correlations in development with both the contract or the effective rental price development.

2. The rental price indices constructed in this research showed that either a rental price index based on *prime* face rental prices published in the market, as well as rental price indices based on *average* face rental prices for *existing* offices differ from the more realistic contract and effective rental price developments in the Amsterdam office markets over the period 2002-2012. Both face

rental price indices show a less volatile *face* rental price index compared to the contract or effective rental price index in the market. Furthermore, the rental prices indices based on contract or effective rents are more cyclical compared to the face rental price indices.

3. Testing the relation between vacancy and rents showed that the *real face rental price* is a significant indicator of the rental adjustments in the Amsterdam office market, due to high correlation with the average vacancy rate. In addition, the correlation between the contract or effective rental price and the average vacancy rate, showed that the *real effective rent level* is also a significant indicator for rental price adjustments in the Amsterdam office market due to the stronger mutual correlation. The latter is in line with the rental adjustment equation (Hendershott, 2004).

This research indicates that both the real face rental price as well as the real effective rental price are significant indicators for analyzing rental price adjustments in the Amsterdam office market.

As a result, their can be concluded that rental price indices based on face rents do not provide an accurate reflection of the market dynamics in the Amsterdam office market over the period 2002-2012. Although the development between face rental prices and effective rental prices is similar, and the relation between face rental prices and the vacancy rate is significant; this research showed that the (*real*)*effective rental price* is a better indicator of the market dynamics in the Amsterdam office market, especially due to the large difference between face and effective rental prices in the market.

2. Do spatial market segments differentiate in market dynamics in the Amsterdam office market over the period 2002-2012?

This research showed no unambiguous answer to this question. The spatial segmentation analysis showed that the *beight* of incentives differs per city-district, sub-office market and business district the last years. However, the correlation analysis showed that the *development* of incentives over the entire period is very similar per city-district and sub-office markets. As a result, the incentive analysis indicates that spatial market segments do not differentiate in market dynamics in the Amsterdam office market over the period 2002-2012. This is proved by the business district analysis, as the incentive development in the South-Axis, WTC and RAI district is significantly correlated with other important business districts, namely Teleport, Arena/Bijlmerplein and the Canal District area.

In addition, the correlation analysis per business district showed that the incentive development is similar in several surrounding business districts, which indicates that market dynamics in surrounding areas are comparable.

The effective rental price analysis showed that the rental price levels significantly differ per city-district, per sub-office market and per business district in Amsterdam the last 10 years. The correlation analysis showed - in contrast to the incentive analysis - only some significant correlations in development between city-districts, sub-office markets and business districts in real effective rental price development. The real effective rental price correlation analysis indicates that spatial market segments mostly differ in market dynamics in the Amsterdam office market over the period 2002-2012. In line with the strong correlation between surrounding districts in the incentive analysis, the business district analysis showed that the three surrounding business districts in City-District South-East are all significantly correlated in real effective rental price development.

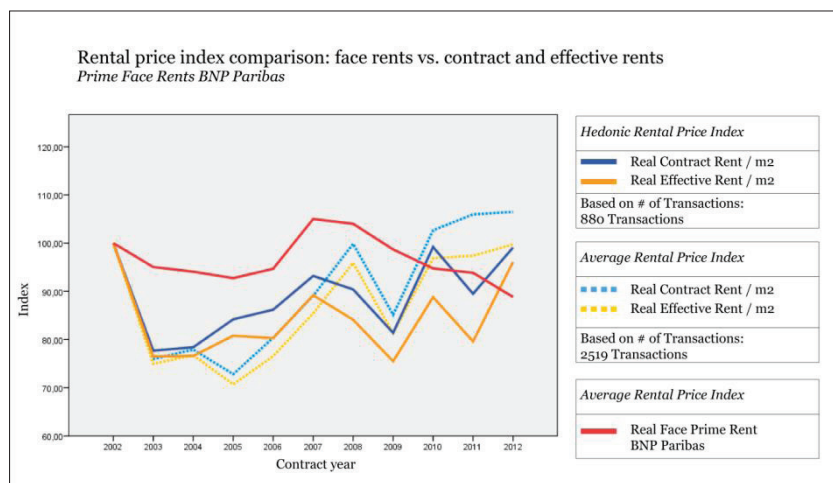


Figure 22. Prime face rental price vs. contract and effective rental price index comparison

Reflection on - and limitations of - research outcomes

The most important limitation of this research is that only *accepted* market conform transactions from the Municipal Tax office are used, instead of the entire transaction database. This database consists of only 1/5th of transactions with an LFA above 500 m², of which most theories and market reports in the real estate market are based.

Furthermore, this research uses a general incentive correction for all transactions, instead of analyzing each transaction individually. In addition, in calculating the effective rental price, only rent-free periods and rental discounts are used as incentives. As a result, the amount of incentives might be higher when all transactions were individually analyzed, and all other incentives were also taken into account.

As there are different vacancy rates in the market, other vacancy rates might provide different relations with the incentive development or the rental prices in the market. Furthermore, in the rental adjustment formula the actual vacancy rate is compared with the natural vacancy rate. This research only uses the actual vacancy rate in the calculations. This research indicates that both the real face rental price as well as the real effective rental price are significant indicators for analyzing rental price adjustments in the Amsterdam office market. This is in contrast to the rental adjustment equation, which indicates a stronger relation with real effective rent levels in the market. This difference might be explained by the following aspects: the small amount of transactions with an LFA > 500 m² in the database; the vacancy is compared with the average rental price development for existing offices instead of the entire market; or the current scale level (city-wide) is not the most appropriate scale level for evaluating the relation between both variables.

The hedonic rental price analysis has a Low R-Square (max. 0,33). This might be explained by the small amount of transactions with an LFA > 500 m² or because there are also transactions included with an LFA < 500 m². As a result, the cyclicity, development and market realistic situation might change in a model with a higher R-Square.

In the transparency transaction analysis, only 106 accurate transactions are connected. This amount is too few in order to provide an accurate conclusion about the *difference* between the face rental prices and effective rental prices in the market. This is similar for the *development* of both rental prices.

Recommendations for further research

This research could be extended by researching the relation between the (real) effective rental price and the vacancy rate per city-districts, sub-office markets and business districts in the Amsterdam sub-office markets. Furthermore, this research could also be conducted for other market segments, for instance the retail market, in order to research the in-transparency by means of the incentive and effective rental price development.

It is also interesting to research the determinants (building and location characteristics) in an (real) effective rental price index compared to a (real) contract rental price index.

In addition, the research could be improved by adding non-accepted transactions to the research, in order to have a larger database, especially for transactions LFA > 500 m², or analyzing each transaction individually in order to calculate the 'true' incentive percentage in the Amsterdam office market.

Recommendations for the real estate market

In order to increase the transparency in the Dutch real estate market, all regular players should publish effective rental prices in the market. A transparent real estate market will lead to a better functioning, and more competitive real estate market, which is also more attractive for foreign investors. Currently some institutions are publishing effective rental prices, although it could never be validated whether a rental price is an effective rental price or a face rental price in the market. As all regular players in the real estate market, have a knowledge advantage due to the in-transparency in the market, I expect that this is really difficult to implement.

As a result of the in-transparency in the market, I would recommend all Municipal Tax offices in the Netherlands, to publish their average calculated market conform effective rental prices per office building or per sub-area in the market. In my opinion, this is the ideal first step to make the office market more transparent. In my opinion, when the market conform rental prices of the Municipal Tax Offices are available for all actors in the market, this might trigger all other regular and private parties to publish effective rental prices (and market conform incentives) in the market. As a result, this will eventually led to a better functioning, more competitive and more transparent office market which is accessible for all actors with an interest in the Dutch real estate market.