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INVESTMENT STRATEGY & RESEARCH

RESEARCH PAPER

The determinants of direct office real estate returns in Europe

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PATRIZIA

Executive Summary

This research brief examines the historic determinants of real estate total returns in 18 major office markets across Europe to draw a better picture on the impact that inflation and interest rate hikes may have on the performance of office real estate. The sensitivity of total returns on market fundamentals is analysed and an empirical portfolio is constructed based on risk-adjusted returns.

The theoretical mechanism behind changes in total returns

Four factors impact returns from direct real estate investments: inflation, GDP, unemployment, and interest rates. The net effect of inflation on real estate returns depends on market conditions and the property's ability to generate sufficient income to offset rising costs.

Market total returns and fundamental economic data

Performance data from MSCI is collected, which reflects changes in income and the valuation of institutional real estate. The performance data is merged with macro- and socio-economic indicators from Oxford Economics. Inflation and interest rates are observed on the NUTS-1 level, whereas GDP, unemployment rates, household disposable income, and the total population are collected on the NUTS-3 level.

The variance decomposition: Returns adapt to market conditions over time

A rolling regression decomposes the relationship between total returns and economic conditions:

(i) Interest rates and inflation have had a significant impact on total returns, but this impact has declined over time.

(ii) GDP growth, population growth, and the change in household disposable income have had a consistent, moderate impact on total returns.

(iii) Labor demand has become the most important indicator for determining total returns, accounting for approximately half of the variation in performance over the past decade.

The return-bridge: A new way to look at total returns

The historic composition of total returns is explained under different market regimes for London, Berlin, Milan, and Frankfurt. The results suggest that unemployment has the most significant negative impact on total returns, followed by interest rates, while GDP growth generally has a positive impact on total returns. The relationship between inflation and total returns is positive.

Total returns' response to synthetic shocks

49 dual shock simulations for different pairs of determinants reveal that interest rates and unemployment had a relatively stronger impact on total return projections compared to GDP growth and inflation.

(i) If interest rates increase by +300 bps and unemployment rates remain stable, total returns decrease by -410 bps, ceteris paribus.

(ii) In a scenario where GDP drops by -300 bps and unemployment rates increase by +300 bps, total returns decrease by -400 bps, ceteris paribus.

The optimal portfolio construction

Our empirical model identifies the level of idiosyncratic risk for each market. Low idiosyncratic risk leads to a better understanding of market performance and lower systemic risk. The return of an institutional portfolio considering this insight as an optimisation criteria increases by +40 bps relative to an equally weighted strategy. Conversely, if a portfolio is optimized contrarian to the idiosyncratic risk the return decreases by -85 bps.

Macroeconomic conditions, supply-demand dynamics and property-specific factors impact market returns

State of research about factors affecting market total returns

"Diversified real estate portfolios do protect against both expected and unexpected inflation and can be used as inflation hedge"

Hartzell et al. (1987)

"Unemployment rates are important drivers of real estate returns"

de Wit and van Dijk (2003)

"Economic growth, unemployment rates, and interest rates have the most dominant and significant factors in explaining commercial real estate returns"

Akinsomi et al. (2017)

"Real estate prices and income can be considered one of the channels through which monetary policy is transmitted onto the economy"

Bouchouicha and Ftiti (2012)

Research goals

- Examine the historic determinants of real estate total returns in 18 major European office markets. SECTION THREE
- Decompose the fundamental drivers of total return in London, Berlin, Milan and Frankfurt. SECTION FOUR
- Simulate the impact that market fundamentals may have on office market performance. SECTION FIVE
- Build the optimal portfolio considering the empirical model SECTION FIVE

Empirical research confirms that four variables generate substantial fluctuations in office total returns

Inflation

Inflation affects real estate returns both positively and negatively:
- Rising inflation can drive up rental income and property values, leading to increased returns.
- Inflation can also lead to higher operating costs and interest rates, which can reduce real estate returns.

The net effect of inflation on direct real estate returns depends on the specific market conditions and the ability of the property (i.e., index clauses) to generate sufficient income to offset the rising costs.

Interest rates

Low interest rates stimulate economic growth in general, and real estate markets in specific, as it becomes cheaper and easier for investors to borrow money to finance their investments. High interest rates increase the cost of debt, reducing the returns from real estate investments. Through this mechanism, interest rates are the main tool for central banks to fulfil their mandates, that is, to maintain price stability, to support economic growth and keep unemployment low during periods of economic downturn.

Economic growth

Higher economic growth leads to increased demand for real estate, and in turn drives up prices. Conversely, an economic slowdown can reduce demand for real estate, leading to lower prices and lower returns.

Labour demand

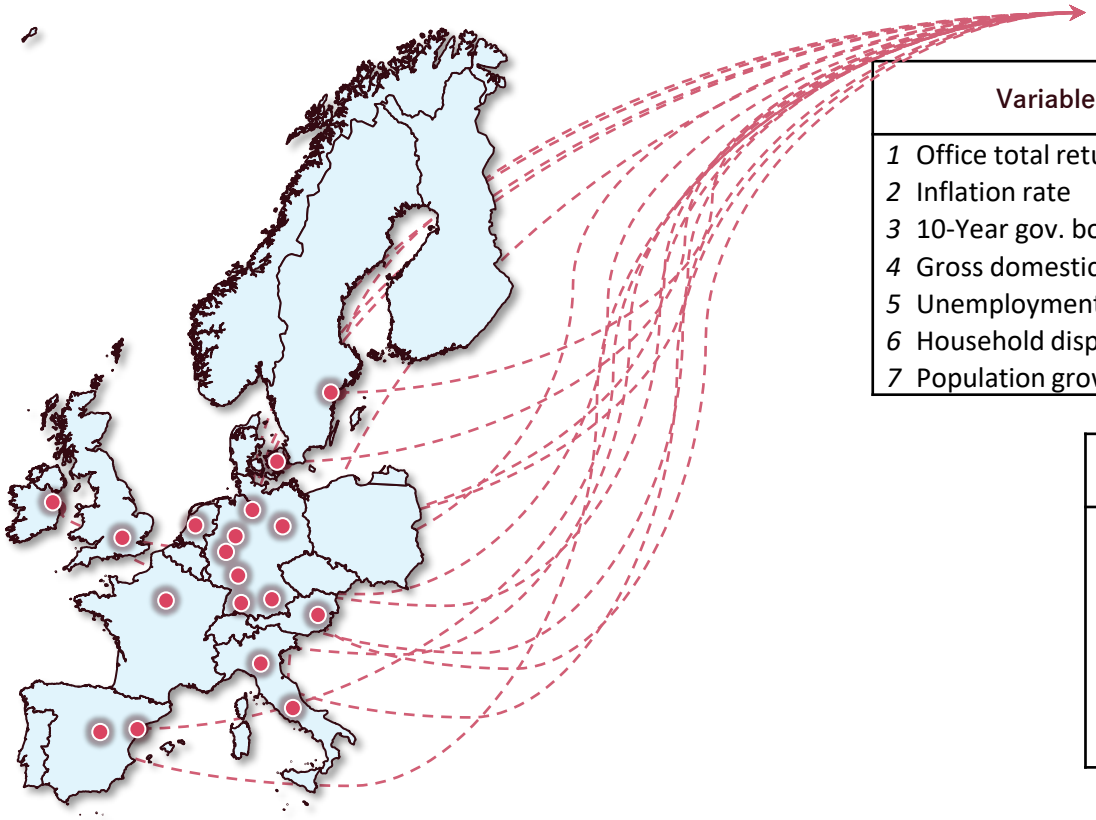
High unemployment rates reduce consumer spending and, as a result, hamper economic growth and the demand for real estate. Vice versa, low unemployment rates stimulate demand for real estate and drive up prices and returns.

Performance data is merged with granular macro- and socio-economic data

Data description

We collect performance data from MSCI reflecting changes in income and the valuation of institutional real estate across 18 European markets spanning the period between 1985 and 2021.

The performance data is merged with macro- and socio-economic indicators from Oxford Economics. Gross domestic product (GDP), unemployment rates, household disposable income, and the total population are collected on the NUTS-3 level.



Descriptive statistics

Variables and units		Distribution			
		Mean	Q1	Median	Q3
1 Office total return	%	7.12	2.87	6.14	10.78
2 Inflation rate	%	1.65	0.80	1.64	2.24
3 10-Year gov. bonds yield	%	3.21	1.16	3.53	4.65
4 Gross domestic product	%	1.79	0.00	2.04	3.91
5 Unemployment rate	%	7.71	5.18	7.04	9.39
6 Household disposable income	%	1.63	0.12	1.38	2.83
7 Population growth	%	0.76	0.26	0.69	1.17

Correlation

	1	*2*	*3*	*4*	*5*	*6*	*7*
1	1.0						
2	0.0	1.0					
3	-0.2	0.4	1.0				
4	0.4	0.1	0.0	1.0			
5	-0.2	-0.1	0.3	-0.2	1.0		
6	0.4	0.0	-0.1	0.5	-0.3	1.0	
7	0.2	0.1	-0.1	0.2	-0.2	0.4	1.0

-1,00 -0,75 -0,25 0,00 0,25 0,75 1,00

Source: PATRIZIA, MSCI, Oxford Economics

Three models for understanding, disaggregating and simulating office total returns

Variance decomposition

We run a rolling regression using both, an extending window as well as a 10-year moving window, starting in 1993 and perform a variance decomposition. The panel linear model explains real estate total returns TR of city i at year t. We control for market and time effects $\boldsymbol{\rho}$ and include the one-year lag of the explanatory variables to capture delayed effects on real estate prices and rents. The model equation is:

$$TR_{it} = \begin{pmatrix} CPI_{it} \\ 10GBonds_{it} \\ \Delta\, GDP_{it} \\ Unemp_{it} \\ \Delta\, HDI_{it} \\ \Delta\, Pop_{it} \end{pmatrix}' \boldsymbol{\beta} + \begin{pmatrix} CPI_{it-1} \\ 10GBonds_{it-1} \\ \Delta\, GDP_{it-1} \\ Unemp_{it-1} \\ \Delta\, HDI_{it-1} \\ \Delta\, Pop_{it-1} \end{pmatrix}' \boldsymbol{\gamma} + \begin{pmatrix} \mu_i \\ \mu_t \end{pmatrix}' \boldsymbol{\rho} + u_{it}$$

Driver recognition

The estimated model allow us to reconstruct the total returns by their main components across time. By multiplying the sensitivities and the market conditions we can assess to which extent market conditions exerted an effect on total returns.

$$\begin{aligned} \widehat{TR_{it}} = {} & \hat{\beta}_1 \cdot CPI + \\ & \hat{\beta}_2 \cdot 10GBonds + \\ & \hat{\beta}_3 \cdot GDP + \\ & \hat{\beta}_4 \cdot Unemp + \\ & \hat{\beta}_5 \cdot HDI + \\ & \hat{\beta}_6 \cdot Pop + \\ & \hat{\boldsymbol{\rho}} \end{aligned}$$

Scenario simulation

We re-estimate the model as a generalized additive model (GAM) with splines. This model is capable of explaining 71% of the variation in total returns, as measured by adjusted R^2. We then assess how total returns may react to changes in economic conditions, e.g. dual shocks of 100 basis points.

$$\widehat{TR_{it}} = \begin{matrix} & & \nearrow GovB \\ & GDP & \\ \nearrow & & \searrow GovB \\ & & \\ \searrow & & \nearrow Unemp \\ & GDP & \\ & & \searrow Unemp \end{matrix} \qquad \widehat{TR_{it}} = \begin{matrix} & & \nearrow Unemp \\ & GovB & \\ \nearrow & & \searrow Unemp \\ & & \\ \searrow & & \nearrow GDP \\ & Inflation & \\ & & \searrow GDP \end{matrix}$$

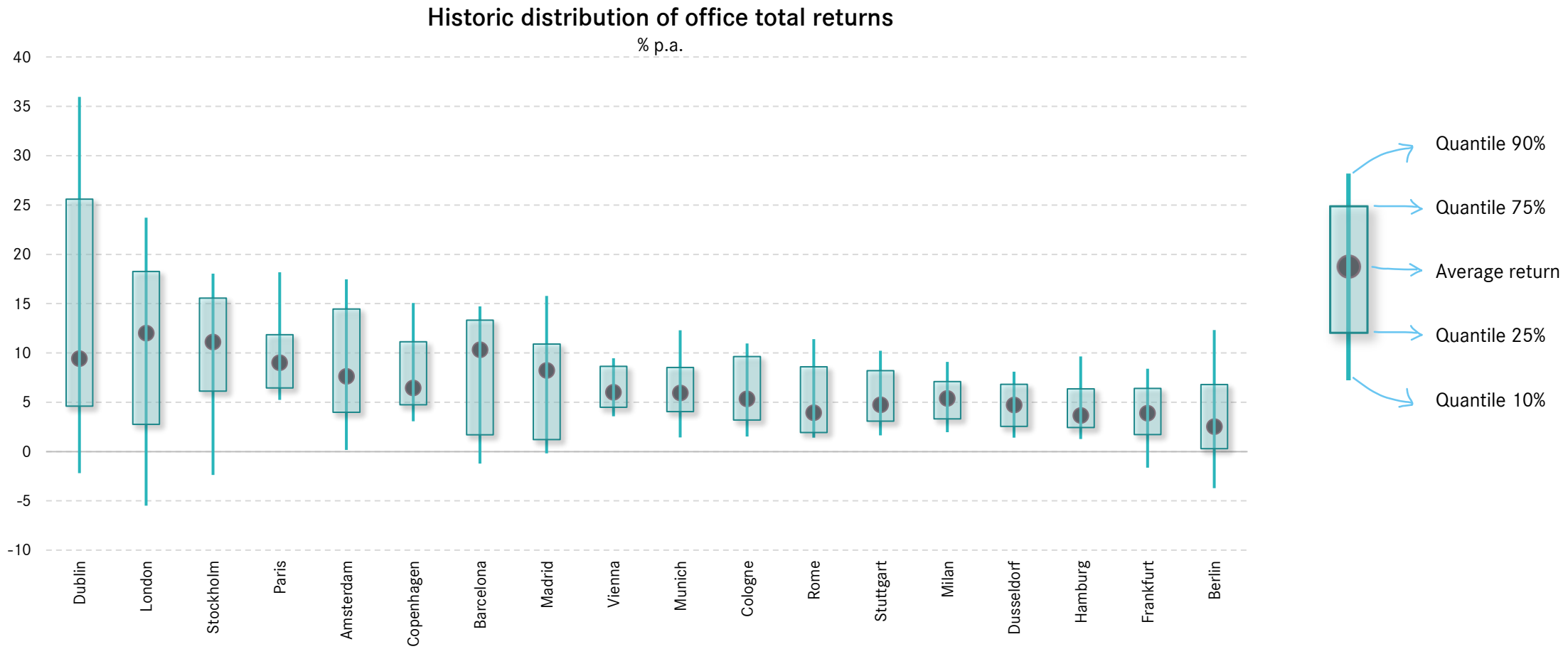
SECTION THREE

SECTION FOUR

SECTION FIVE

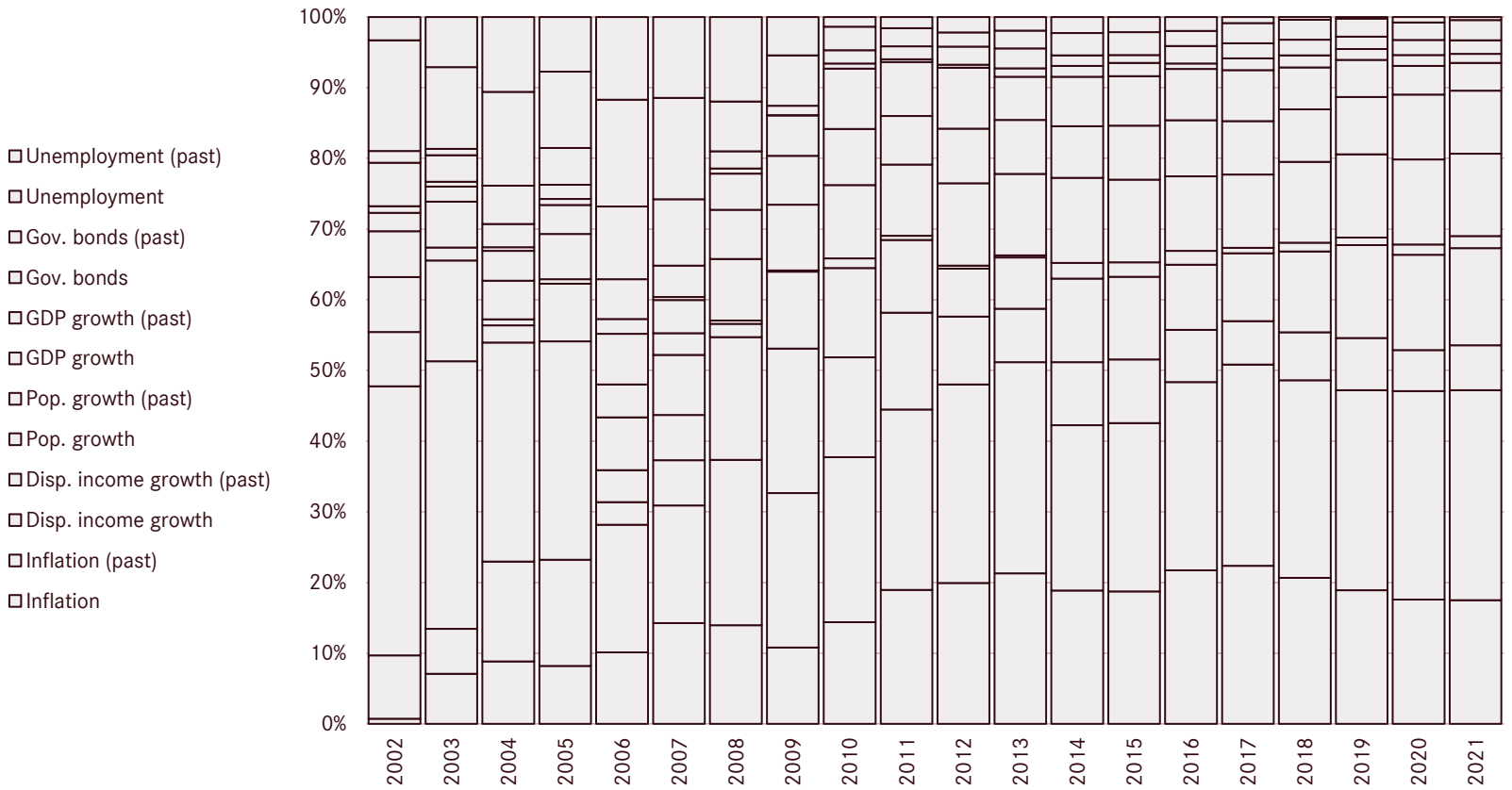
Source: PATRIZIA

Higher office total returns are achieved at cost of higher dispersion



Source: PATRIZIA, MSCI

Market fundamentals explain changes in total returns – the effects vary significantly over time

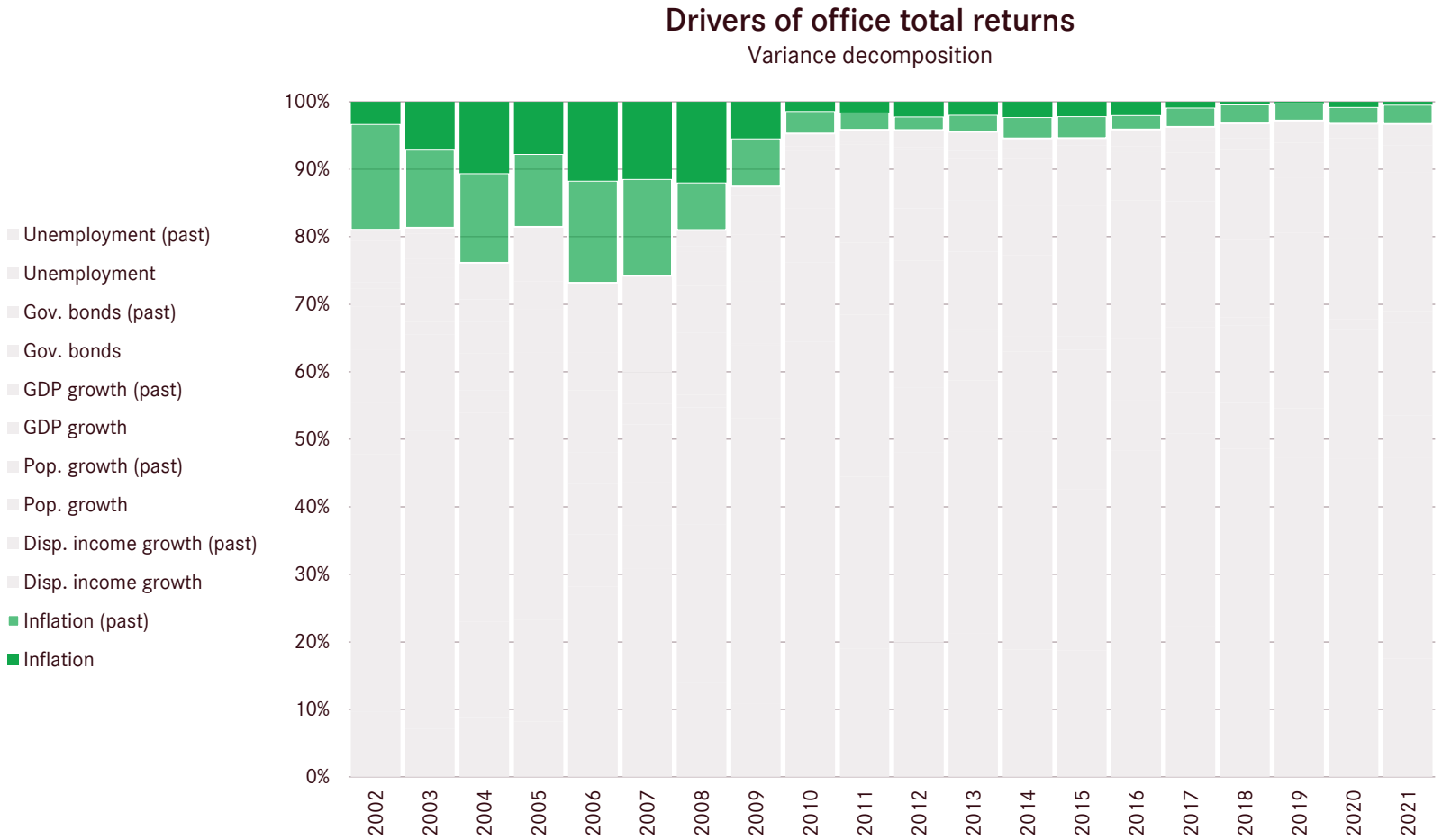


The variance decomposition indicates the amount of information each market fundamental contributes to explaining the total returns.

It determines how much of the variance of the total returns can be explained by exogenous shocks.

Source: PATRIZIA, MSCI, Oxford Economics

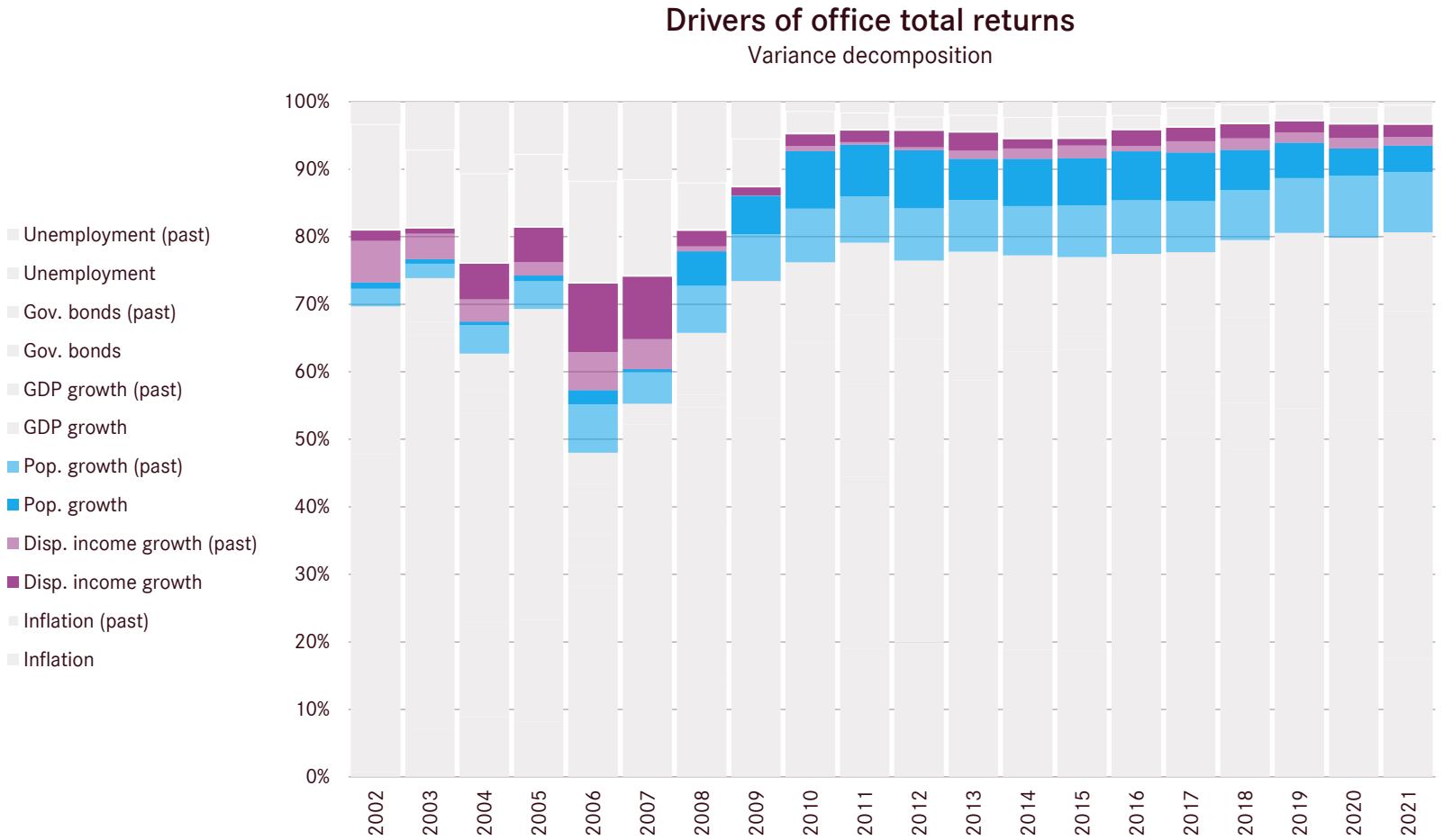
Inflation has lost relative importance in explaining total returns post-GFC



- **Inflation** has impacted the variation in total returns by up to one-quarter prior to 2009, with the effect remaining relatively low (i.e., below 6%) thereafter.
- The effect of inflation on total returns appears to be delayed by up to one year.

Source: PATRIZIA, MSCI, Oxford Economics

Socio-economic indicators show an evident and stable influence over the years

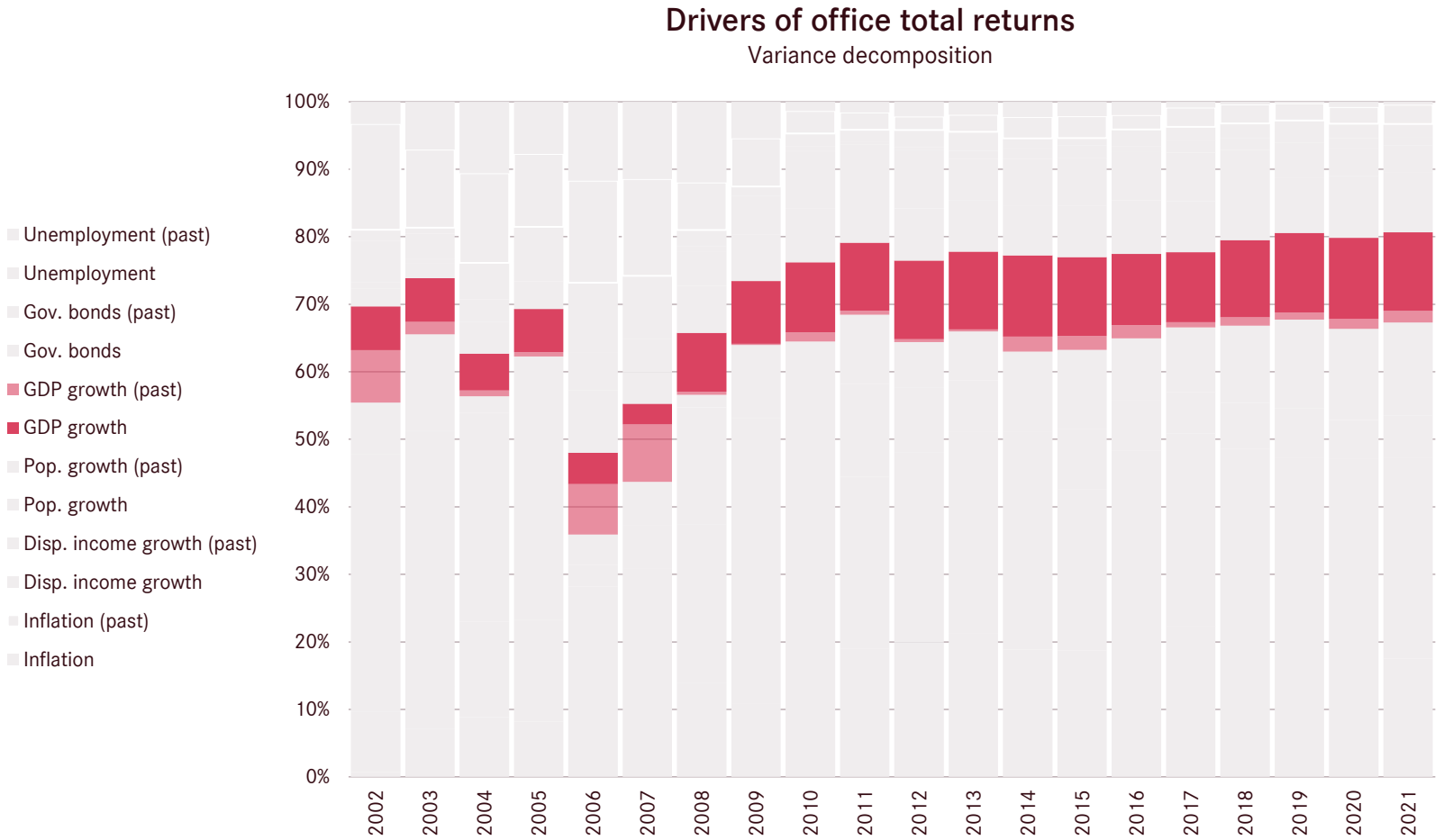


Source: PATRIZIA, MSCI, Oxford Economics

Socio-economic factors, that is population growth and the change in household disposable income, show a stable, moderate impact on total returns, averaging 16% over the years.

During the past decade, most of the variation explained by socio-economic factors is attributable to changes in the population of a market

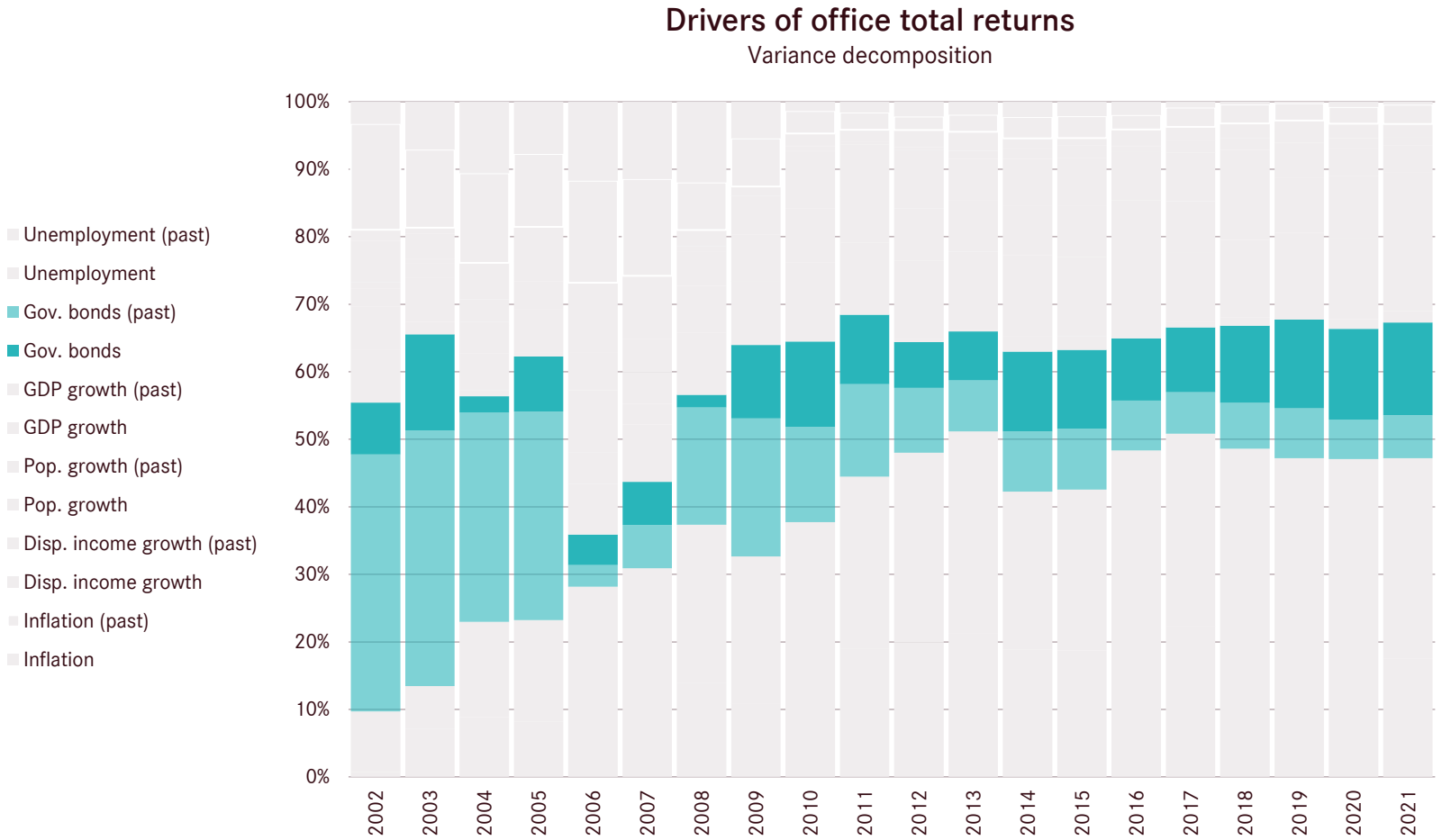
GDP proves to be an important total return driver throughout the last two decades



GDP growth has affected total returns moderately by an average of approximately 11% over the years, with the contribution being consistent throughout the years and the lag playing a less dominant role.

Source: PATRIZIA, MSCI, Oxford Economics

Interest rates remain a crucial predictor of total returns despite weakening effects

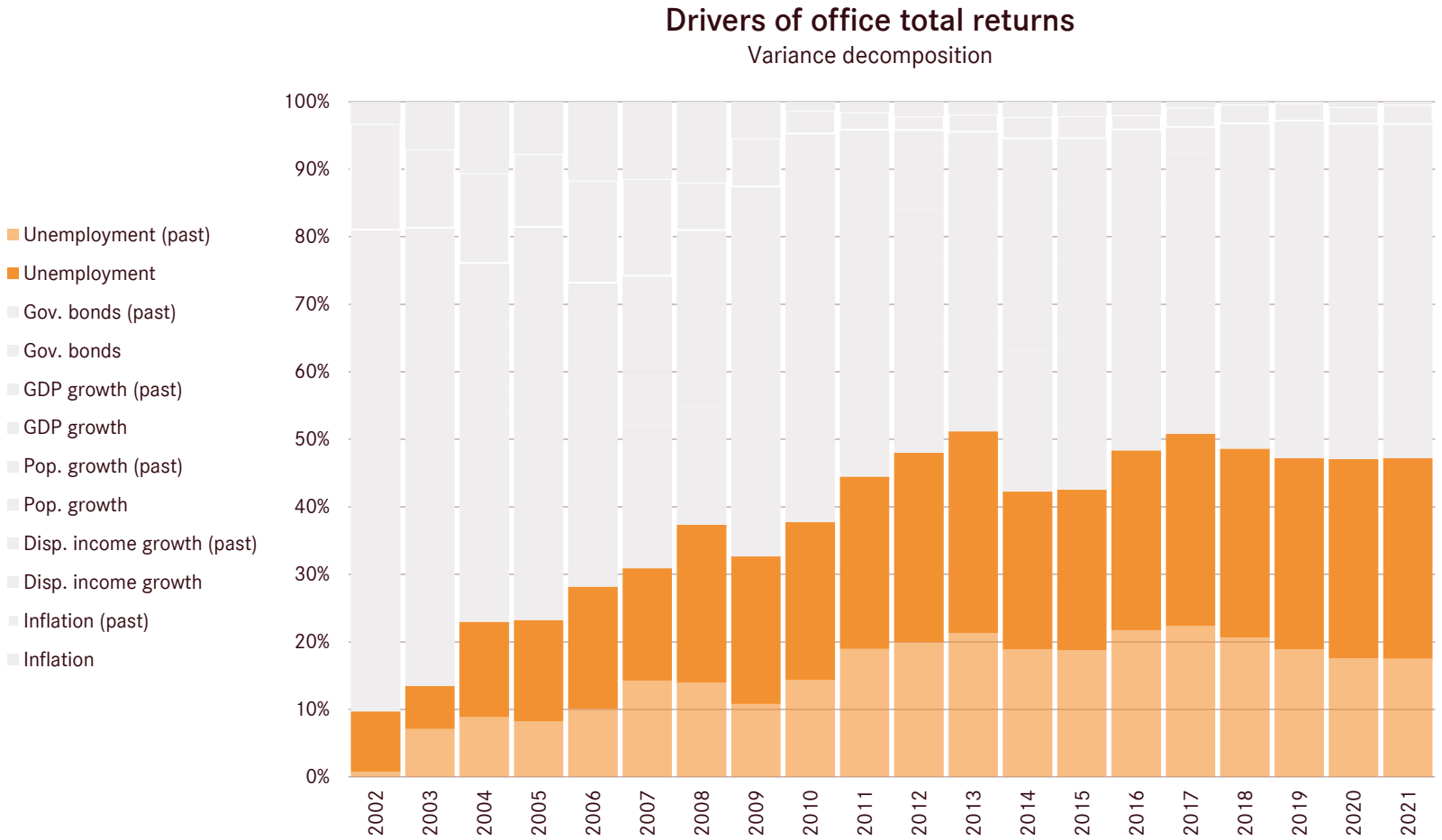


Source: PATRIZIA, MSCI, Oxford Economics

Interest rates have contributed from one-third to half of the variation in total returns prior to 2006, remaining well below one-third thereafter.

Most of the effect in the first years is attributable to the one-year lag in interest rates, indicating a delayed reaction of total returns on changes in monetary policy.

Unemployment has never been more important than now in explaining total returns



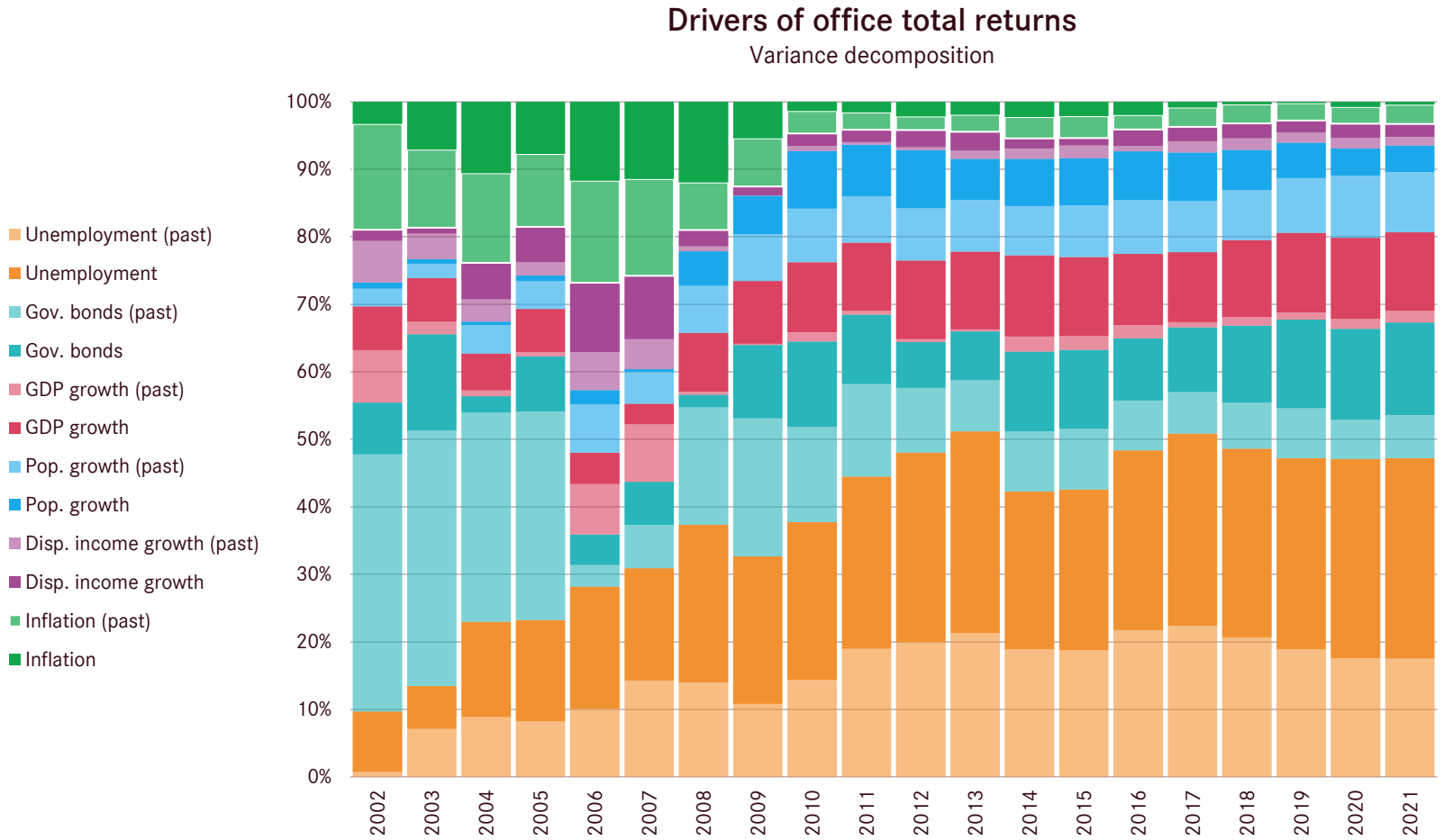
Source: PATRIZIA, MSCI, Oxford Economics

Unemployment seems to have become the key indicator for determining total returns having significantly gained in importance over the years.

In fact, total returns have never been more dependent on labour markets than during the past decade with approximately half of the variation in performance being attributable to unemployment rates.

This means: a healthy labour market is likely to be a necessary condition for stable returns

Overall, unemployment and interest rates have been the key proxies of historic total returns while inflation has lost significance over the years



Source: PATRIZIA, MSCI, Oxford Economics

The drivers of office total returns

Unemployment, interest rates, and economic growth are the three most significant drivers of total returns in European office markets, while inflation and socio-demographic factors have become relatively less important.

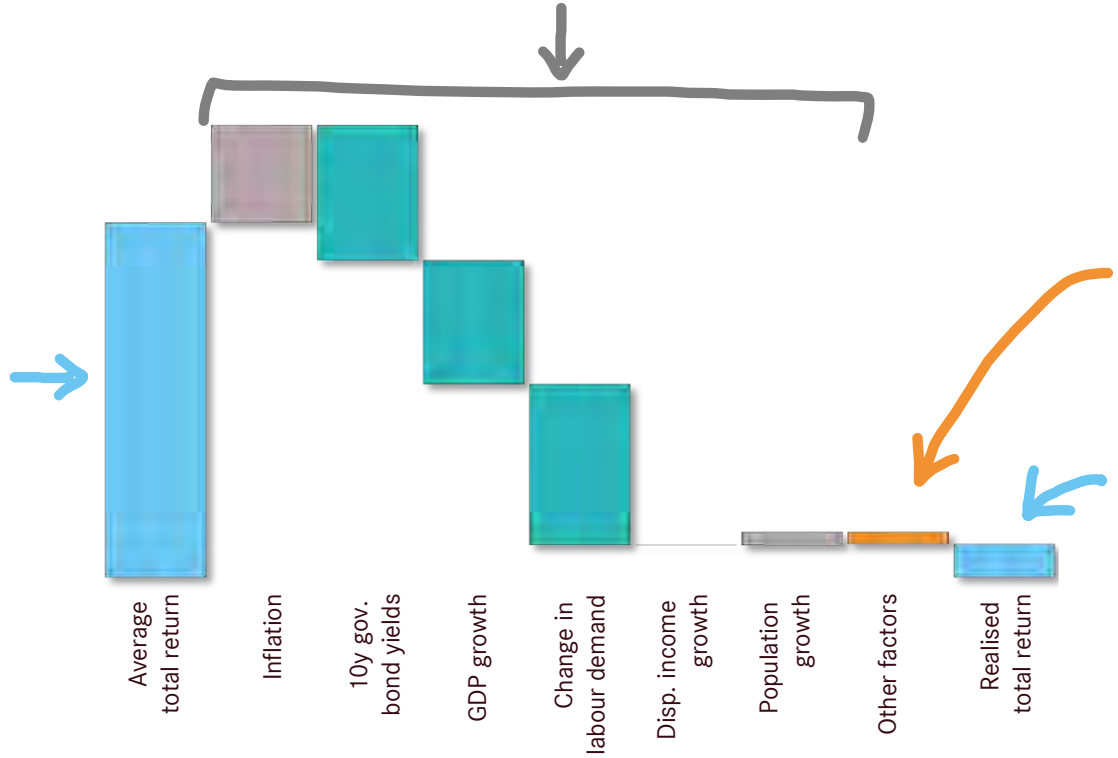
Reconstructing historic total returns by their main fundamentals
What did happen?

Against the background of the key determinants presented in the previous chapter, this section analyses how total returns in European office markets behave under varying economic conditions.

The bridge plots illustrate how the market development has impacted total returns during different economic conditions, i.e., 2009 and 2017.

The bars in between indicate positive or negative contributions of **systemic variables** to the total return.

The left bar represents the starting point of the total return that is equivalent to **market and time averages**, so called fixed effects.



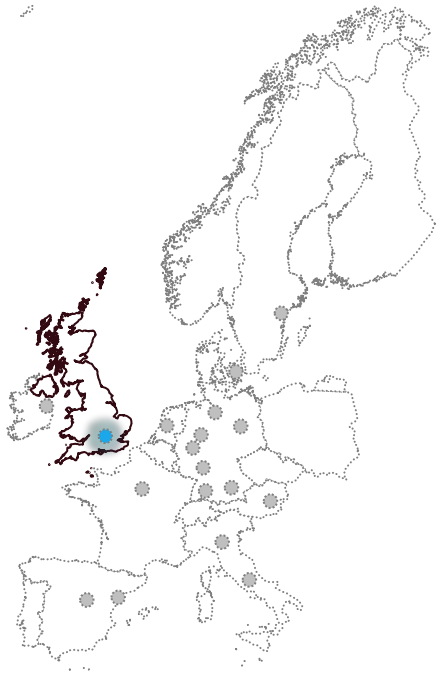
Idiosyncratic risks, i.e. factors that couldn't be explained by the model

The bar on the right displays the **realized total return** for a particular market in a specific year.

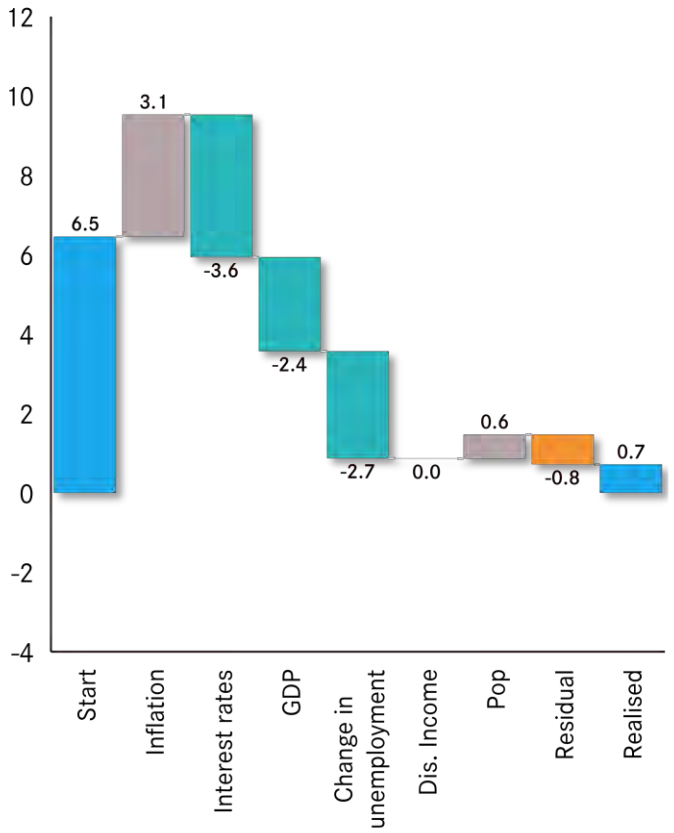
Source: PATRIZIA, MSCI, Oxford Economics

London: GFC turmoil resulted in low total returns whilst the decrease in labour demand in 2017 impacted total returns negatively

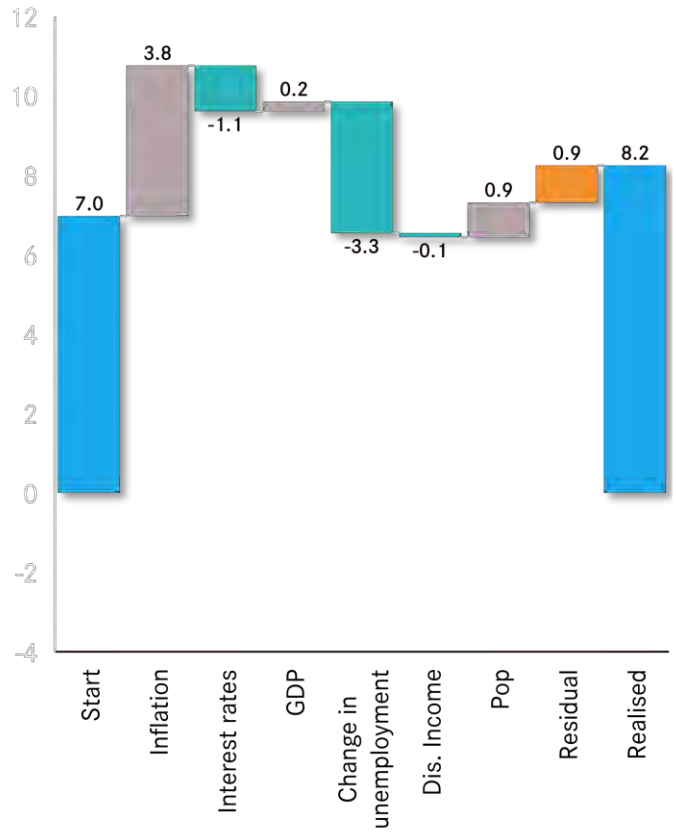
London



2009



2017



The year **2009** represents a market phase with weakening labor markets, moderate interest rates, and a significant economic downturn as a result of the GFC. The year **2017** marked a phase with a loose monetary policy in Europe stimulating labor demand and economic growth.

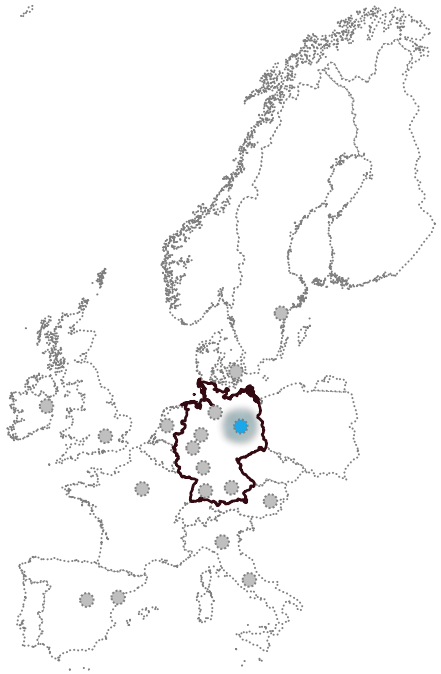
In London, **2009**, the unemployment rose yoy by 200 bps, the government bond yield was 3.88%, and economic growth experienced a sharp contraction of -6.06%.

In **2017**, the unemployment rate rose by 250 bps yoy, with a government bond yield of 1.24% and economic growth at 0.61%.

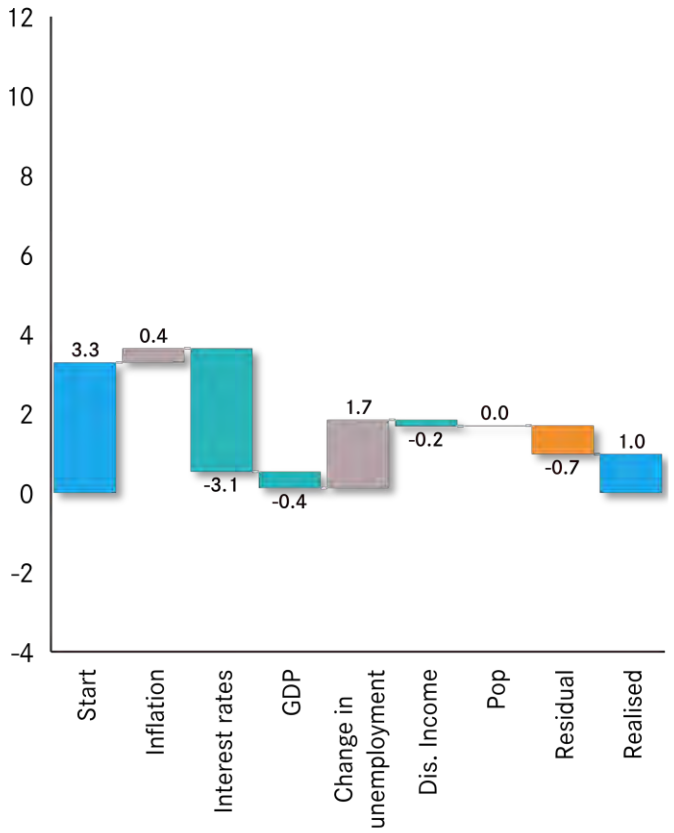
Source: PATRIZIA, MSCI, Oxford Economics

Berlin: Total returns have benefited from bond yield compression and strong economic growth post-GFC

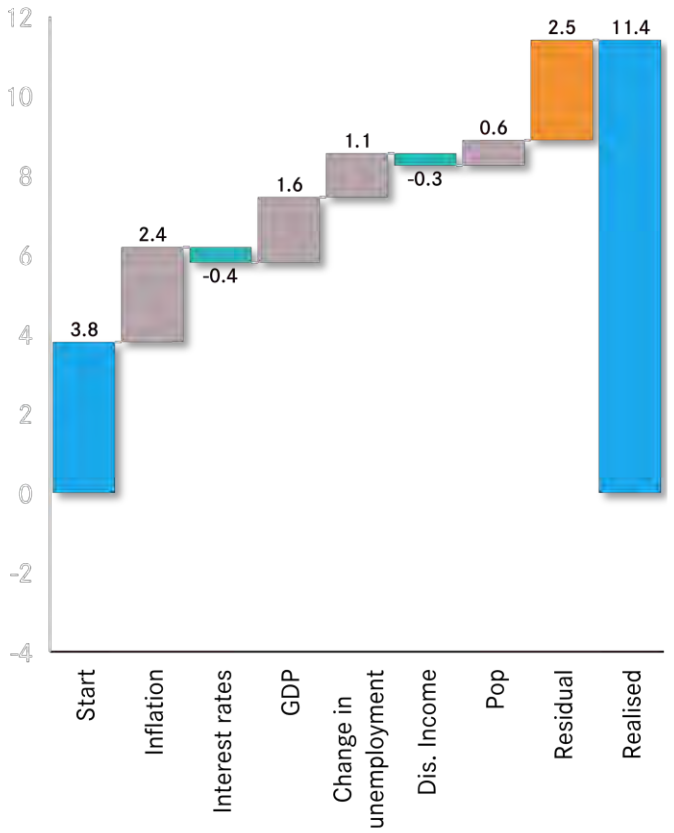
Berlin



2009



2017



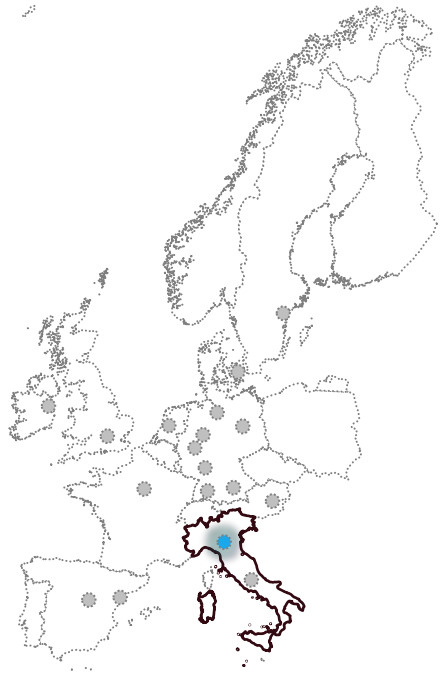
In Berlin, **2009**, the unemployment rate decreased by 130 bps yoy, with a government bond yield of 3.34% and economic growth down by -1.07%.

In **2017**, the unemployment rate decreased by 85 bps yoy, the government bond yield dropped to 0.42%, and economic growth rose by 4.20%.

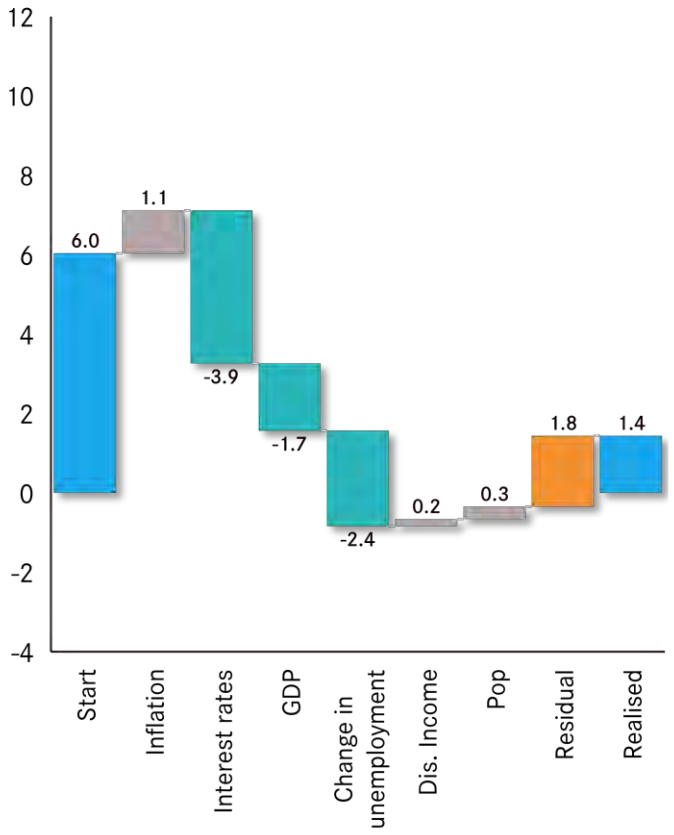
Source: PATRIZIA, MSCI, Oxford Economics

Milan: Total returns have benefited from city's economic expansion and less from bond yield compression

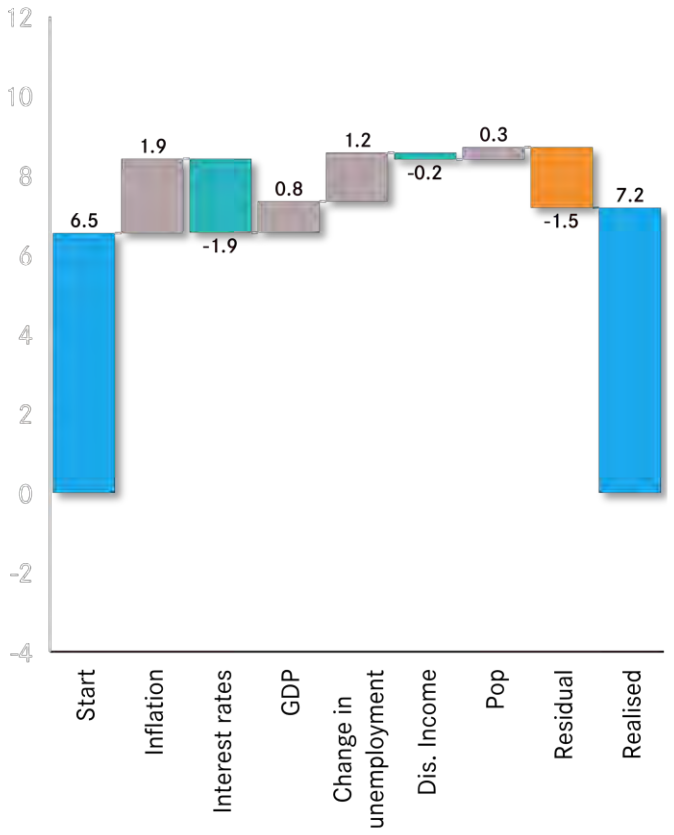
Milan



2009



2017



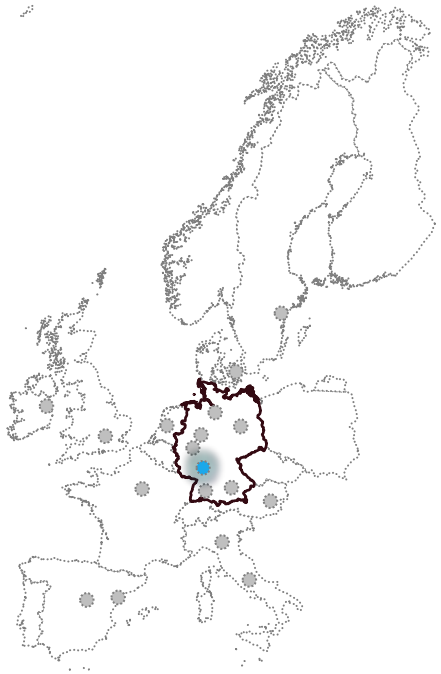
In Milan, **2009**, the unemployment rate rose by 180 bps yoy, the government bond yield was 4.16%, and economic growth experienced a downturn of -4.34%.

In **2017**, the unemployment rate decreased by 94 bps yoy, despite a decreasing government bond yield of 2.00% and economic growth at 2.00%.

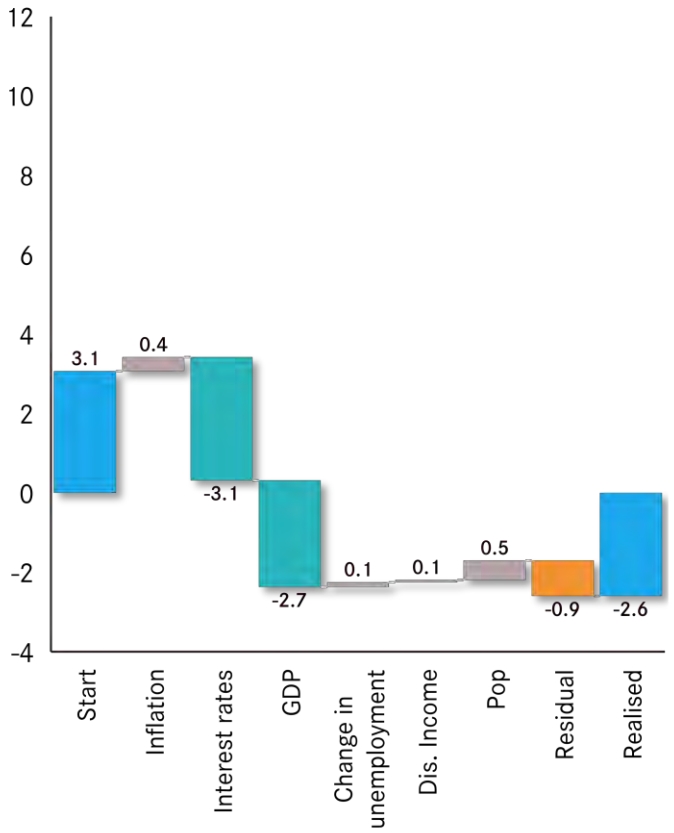
Source: PATRIZIA, MSCI, Oxford Economics

Frankfurt: Negative return in 2009 is not attributable to labour demand but to negative economic and financial conditions

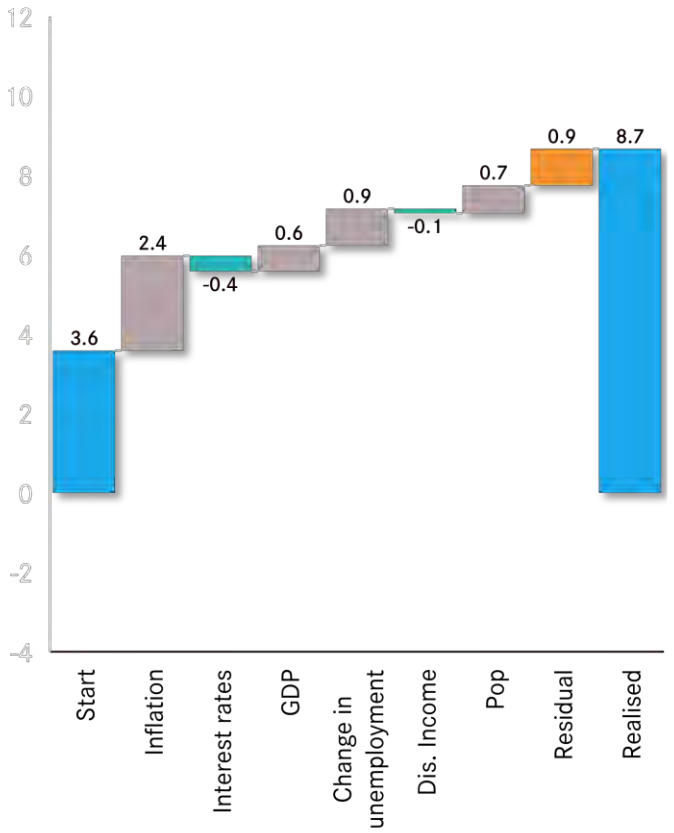
Frankfurt



2009



2017



In Frankfurt, **2009**, the unemployment rate decreased by 10 bps yoy, with a government bond yield of 3.34% and economic growth down by -6.88%.

In **2017**, the unemployment rate decreased by 70 bps yoy, the government bond yield dropped to 0.42%, and economic growth rose by 1.64%.

Source: PATRIZIA, MSCI, Oxford Economics

Stressing the system: how do total returns react in systemic shock scenarios?

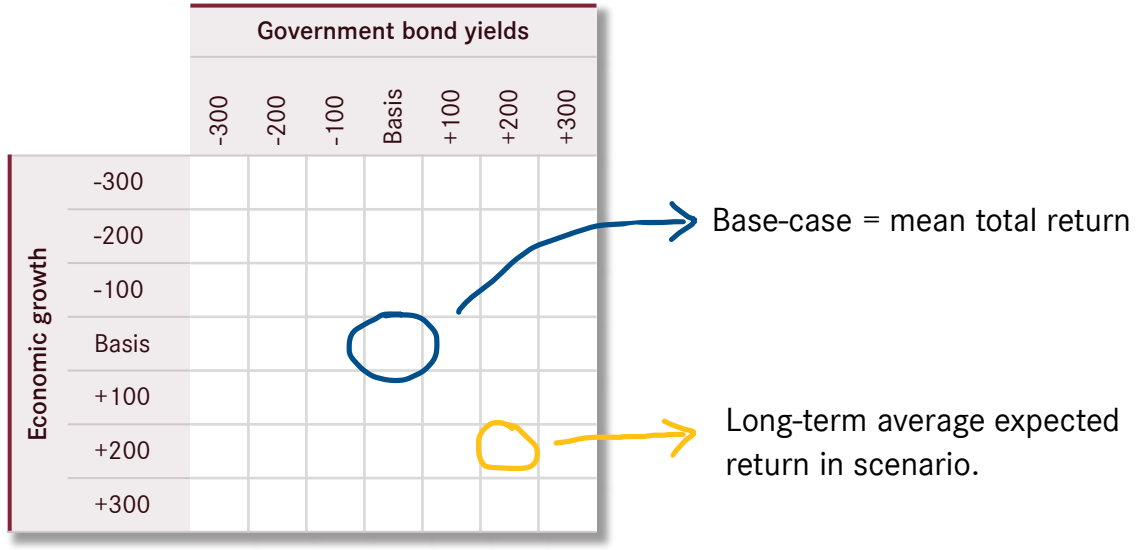
Having identified the most important drivers and their impact on European office returns, we now simulate stress scenarios and assess how total returns react to changes in economic conditions.

We created dual shocks by altering the key determinants by 100 basis points ranging from -300 bps to +300 bps.

We define four scenarios for each pair of determinants.

Predictions

The **shock matrices** depict the expected mean total return across all markets and years for each scenario, with all other factors held constant.



Source: PATRIZIA, MSCI, Oxford Economics

Total returns react most sensitive to changes in bond yields and unemployment

$$\widehat{TR_{it}} = \updownarrow Economic\ growth \\ \updownarrow Government\ bonds$$

Economic growth \ Government bond yields	-300	-200	-100	Basis	+100	+200	+300
-300	7.7	4.9	3.6	2.1	0.0	-1.2	-2.0
-200	11.7	8.9	7.6	6.1	4.1	2.8	2.0
-100	12.5	9.8	8.5	6.9	4.9	3.7	2.8
Basis	12.5	9.7	8.4	6.9	4.9	3.6	2.8
+100	11.1	8.3	7.0	5.5	3.4	2.2	1.4
+200	10.0	7.2	5.9	4.4	2.3	1.1	0.3
+300	13.4	10.6	9.3	7.8	5.8	4.5	3.7

Worst case: If government bond yields increase by +300 bps and GDP growth decreases by -300 bps, the long-term total return in European office markets is expected to decrease from 6.9% to -2.0%.

In a scenario with high interest rates and average economic growth, we expect a total return of 2.8%, that is 410 bps less than the long-term average.

$$\widehat{TR_{it}} = \updownarrow Economic\ growth \\ \updownarrow Unemployment$$

Economic growth \ Unemployment rate	-300	-200	-100	Basis	+100	+200	+300
-300	10.3	8.7	7.3	6.1	5.0	4.0	2.9
-200	10.6	8.9	7.5	6.3	5.2	4.2	3.2
-100	10.8	9.2	7.8	6.6	5.5	4.5	3.4
Basis	11.2	9.5	8.1	6.9	5.8	4.8	3.8
+100	11.5	9.8	8.4	7.2	6.1	5.1	4.1
+200	11.8	10.1	8.7	7.5	6.4	5.4	4.4
+300	12.0	10.4	9.0	7.8	6.7	5.6	4.6

Worst case: The expected long-term total return averages 2.9% in a scenario where GDP drops by -300 bps and the unemployment rate increases by +300 bps.

With an expected value of 3.8%, total returns are still expected to remain significantly below the average of 6.9% if economic output stagnates and unemployment rates rise by 300 bps.

Unemployment has a relatively stronger effect on total returns compared to GDP growth.

Source: PATRIZIA, MSCI, Oxford Economics

Weak labour market conditions and bond yield decompression lessen expected total returns whilst an extreme inflationary scenario shows limited effects

$$\widehat{TR_{it}} = \updownarrow Government\ bonds \\ \updownarrow Unemployment$$

Government bond yields \ Unemployment	-300	-200	-100	Basis	+100	+200	+300
-300	16.8	15.1	13.7	12.5	11.4	10.4	9.3
-200	14.0	12.3	10.9	9.7	8.6	7.6	6.6
-100	12.7	11.0	9.6	8.4	7.3	6.3	5.3
Basis	11.2	9.5	8.1	6.9	5.8	4.8	3.8
+100	9.1	7.5	6.1	4.9	3.8	2.7	1.7
+200	7.9	6.3	4.9	3.6	2.5	1.5	0.5
+300	7.1	5.4	4.0	2.8	1.7	0.7	-0.4

Worst case: An increase in interest and unemployment rates by 300 bps leads to an expected long-term total return drop to -0.4%.

If interest rates were to remain at an elevated level of +300 bps from the base-case and unemployment rates remain stable, we expect an average long-term total return of 2.8%.

Both interest rates and unemployment have a strong impact on total returns.

$$\widehat{TR_{it}} = \updownarrow Inflation \\ \updownarrow Economic\ growth$$

Inflation \ Economic growth	-300	-200	-100	Basis	+100	+200	+300
-300	2.1	2.3	2.6	2.9	3.2	3.5	3.7
-200	5.9	6.1	6.4	6.7	7.0	7.3	7.6
-100	6.4	6.7	6.9	7.3	7.6	7.9	8.1
Basis	6.1	6.3	6.6	6.9	7.2	7.5	7.8
+100	4.3	4.5	4.8	5.1	5.5	5.8	6.0
+200	2.9	3.2	3.4	3.8	4.1	4.4	4.6
+300	6.1	6.4	6.6	7.0	7.3	7.6	7.8

Worst case: Deflation and economic stagnation result in a long-term total return projection of 2.1% on average.

High inflation and economic stagnation lead to an expected total return of 6.1%.

Source: PATRIZIA, MSCI, Oxford Economics

Portfolio construction: Non-systemic risks should be rewarded with higher returns

The estimated **model explains 71%** of the realised total returns. That means that changes in total returns are up to 71% attributable to systemic changes in GDP, labour demand, interest rates, inflation and socioeconomic conditions.

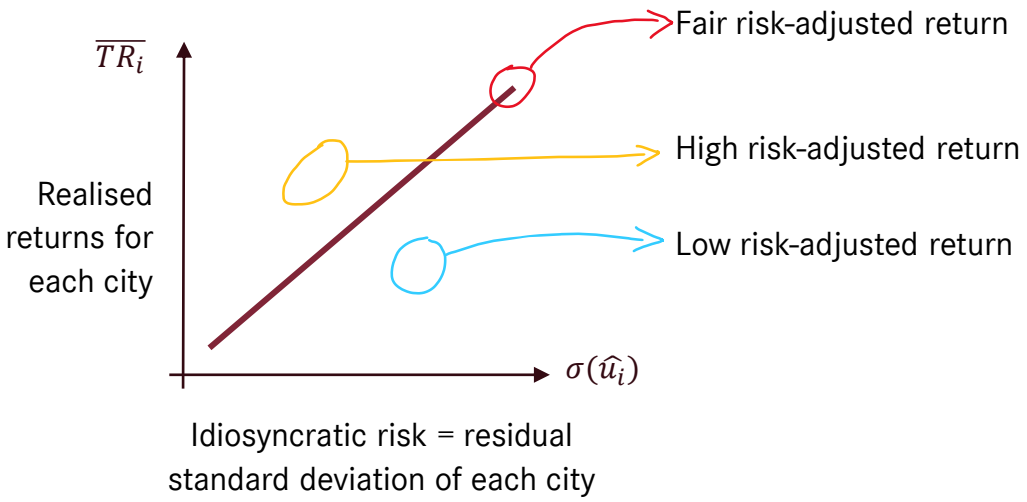
The remaining variation in total returns is attributable to other idiosyncratic factors. The lower the idiosyncratic risk, the better we understand the market performance.

High returns are expected in cities with higher idiosyncratic risks (risk-reward).

In this section we mathematically create a portfolio based on idiosyncratic risk as an optimisation factor:

Total return model

$$TR_{it} = \boldsymbol{X}_{it}\boldsymbol{\beta} + \boldsymbol{X}_{it-1}\boldsymbol{\gamma} + f(\boldsymbol{X}_{it}) + \begin{pmatrix}\mu_i \\ \mu_t\end{pmatrix}' \boldsymbol{\rho} + u_{it}$$



Source: PATRIZIA, MSCI, Oxford Economics

Three cluster of cities emerge after matching total returns with idiosyncratic risks

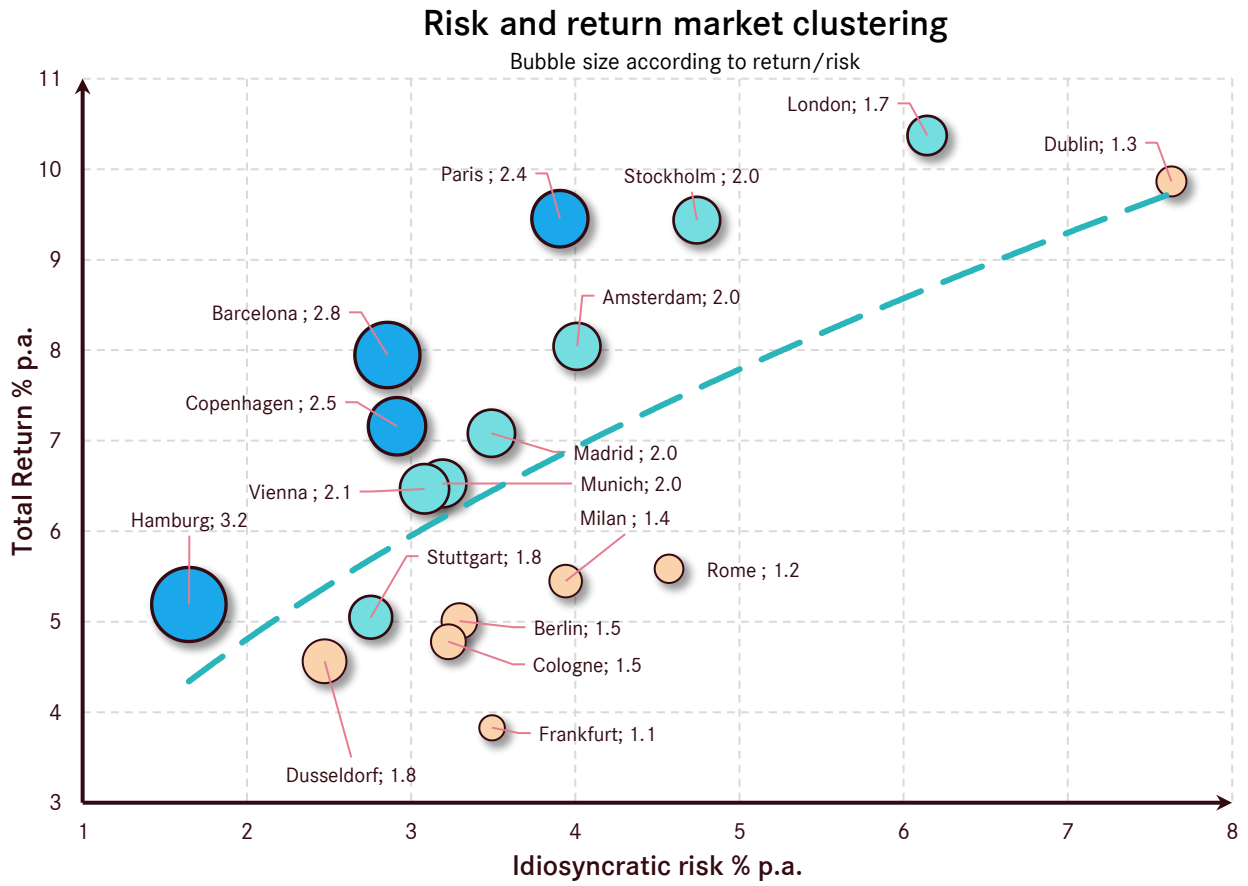
Return-risk ratio

High

Average

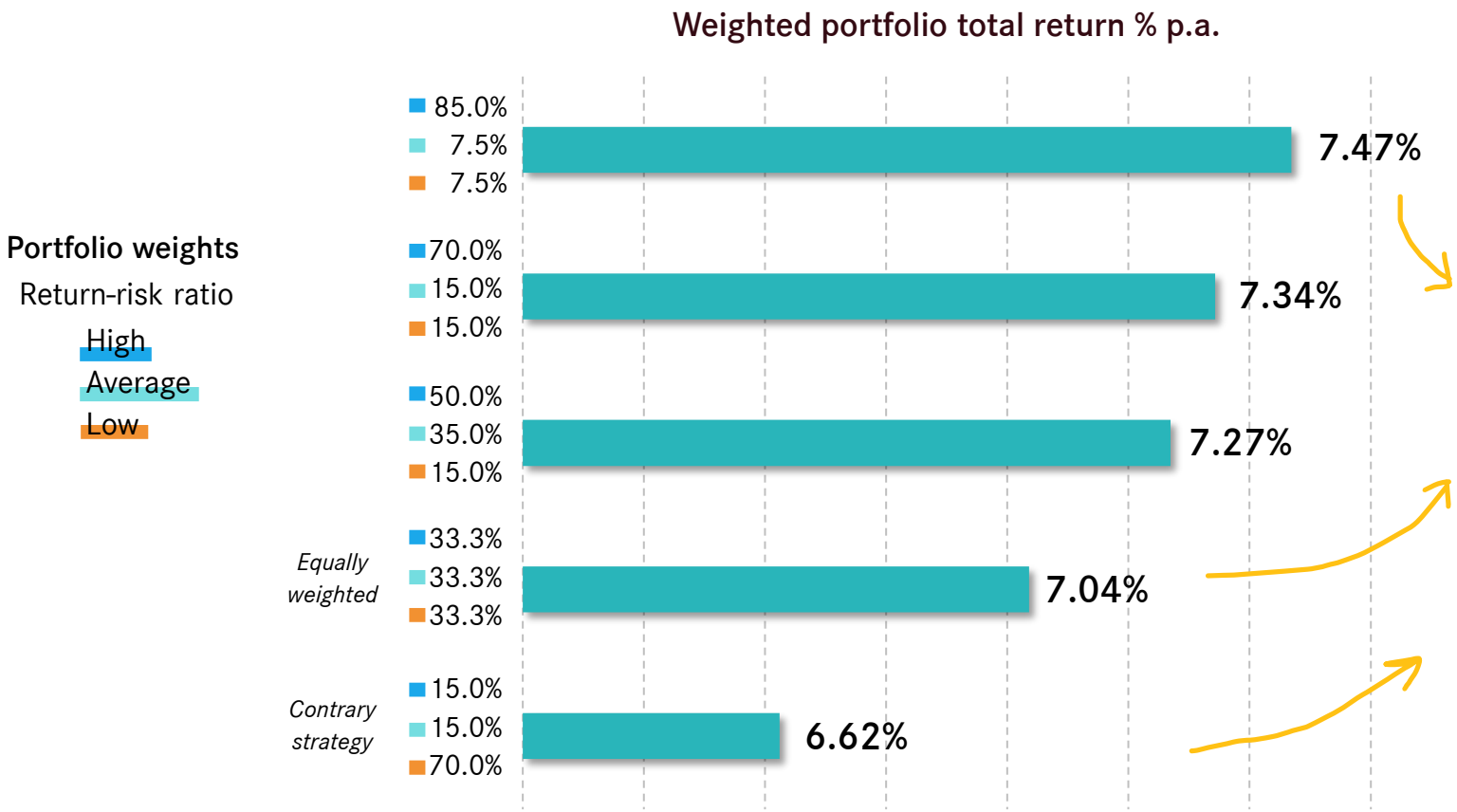
Low

Market	Total return %p.a.	Idiosyncratic risk %p.a.	Return / risk ratio
Amsterdam	8.0	4.0	2.0
Barcelona	7.9	2.9	2.8
Berlin	5.0	3.3	1.5
Dublin	9.9	7.6	1.3
London	10.4	6.1	1.7
Cologne	4.8	3.2	1.5
Copenhagen	7.2	2.9	2.5
Dusseldorf	4.6	2.5	1.8
Frankfurt	3.8	3.5	1.1
Hamburg	5.2	1.6	3.2
Madrid	7.1	3.5	2.0
Milan	5.4	3.9	1.4
Munich	6.5	3.2	2.0
Paris	9.5	3.9	2.4
Rome	5.6	4.6	1.2
Stockholm	9.4	4.7	2.0
Stuttgart	5.0	2.8	1.8
Vienna	6.5	3.1	2.1



Source: PATRIZIA, MSCI, Oxford Economics

Higher portfolio total returns are expected when optimizing portfolios via idiosyncratic risks



What investment strategy leads to the highest portfolio return based on 18 office European markets?

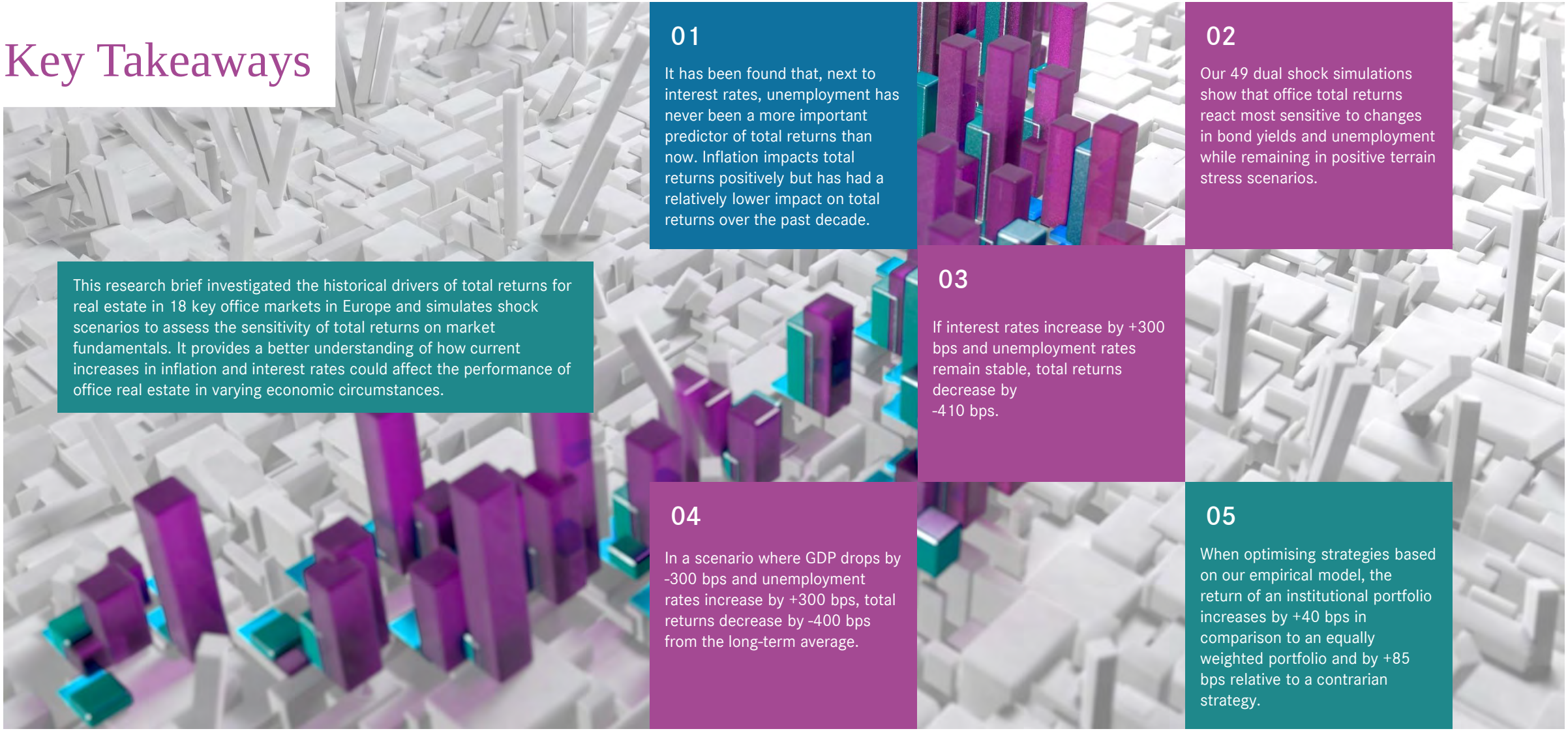
The return of a portfolio considering market idiosyncratic risks equals 7.47% p.a.

An *equally weighted* portfolio leads to a portfolio return of 7.04% p.a.

The *contrary strategy*, i.e. 70% of the equity is invested in office markets with low idiosyncratic risks, leads to a portfolio return of 6.62%

Source: PATRIZIA, MSCI, Oxford Economics

Key Takeaways



This research brief investigated the historical drivers of total returns for real estate in 18 key office markets in Europe and simulates shock scenarios to assess the sensitivity of total returns on market fundamentals. It provides a better understanding of how current increases in inflation and interest rates could affect the performance of office real estate in varying economic circumstances.

01

It has been found that, next to interest rates, unemployment has never been a more important predictor of total returns than now. Inflation impacts total returns positively but has had a relatively lower impact on total returns over the past decade.

02

Our 49 dual shock simulations show that office total returns react most sensitive to changes in bond yields and unemployment while remaining in positive terrain stress scenarios.

03

If interest rates increase by +300 bps and unemployment rates remain stable, total returns decrease by
-410 bps.

04

In a scenario where GDP drops by -300 bps and unemployment rates increase by +300 bps, total returns decrease by -400 bps from the long-term average.

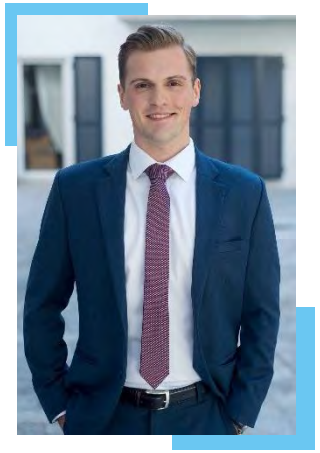
05

When optimising strategies based on our empirical model, the return of an institutional portfolio increases by +40 bps in comparison to an equally weighted portfolio and by +85 bps relative to a contrarian strategy.

Footer / Source

PD Dr. Marcelo Cajias

Head of Data Intelligence



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