A new real estate index of the Swiss multi-family housing market

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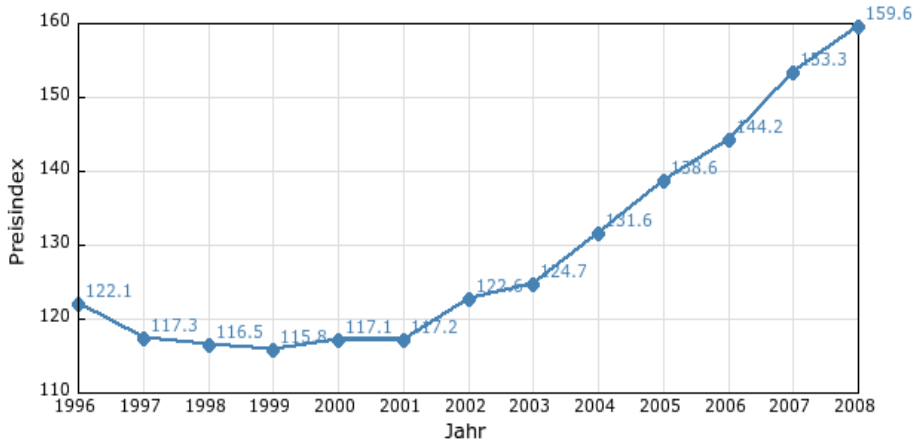
Why a new index?

The existing indexes have a relatively short history being composed of both residential, commercial and office transactions.

- The Wüest & Partner is a transaction-based hedonic index which starts in 1985 (publicly available only from 1996).
- The IAZI index is also a transaction based index which starts in 1987. It comprises both commercial and residential property (some 2849 transactions).
- The ZKB MFH index is a transaction-based index which stops though in 2000.

The period which these two indexes cover does not include a full real estate cycle making it difficult to see the actual development of property prices in up and down markets.

The existing indexes



Further motivations for a new index

- These indexes are used as benchmarks for portfolio evaluation. The actual composition of the sample on which the index is based may not be similar to the composition of a portfolio under scrutiny(weighting between residential, commercial and office).
- The IAZI index is used to proxy the risk that institutional investors face when investing in the Swiss direct real market (see the Swiss Solvency Test).

The aim of the new index

The new index tries to depict as accurate as possible the development of the *residential* sector of the Swiss real estate market; focus is on the investment grade properties held in the portfolios of institutional investors.

- Develop an index which reaches further back in time than the existing indexes.
- The index composition is known and focuses on that part of the market which is dominant in the real estate bucket of institutional investors.

What is special about real estate prices?

On any trading day you may find out the price of a given stock or fund by simply checking it on-line. The existence of a well-organized and liquid market makes this task very easy and cheap.

- The price of a given piece of property is not available unless a transaction or an appraisal takes place. The infrequent transaction of properties leads to a need to use appraisers.
- Appraisal prices are costly and time-consuming to obtain (need to hire an appraiser).
- The presence of the appraiser introduces arbitrariness in the estimated price (average 10% spread around "equilibrium" price (Diaz-Wolverton 1989)).
- The actual transaction price at which the deal is conducted can be quite different from what the appraiser recommends (negotiating skills, market liquidity, etc.).

How to deal with such data?

The existing techniques can be categorized according to the type of data employed and the methodology used in computing the index

- *Appraisal-based* indexes - are computed from appraisal data
  - Hedonic indexes (Rosen 1974)
  - Repeated-sale indexes (Bailey, Muth, Nourse - 1963; Case, Shiller - 1987, 1989)
  - An important point here is that adjustments are needed due to appraisal biases (smoothing).
- *Transaction-based* indexes - are indexes computed from actual transaction prices
  - The methodologies employed relate to the ones used in appraisal-based indexes.

The hedonic model

The hedonic index decomposes the value of a property in its constituent components controlling in this way for any quality change over time

$$V_{it} = \beta_{0,t} + \sum_{j=1}^{n} \beta_j H_{j,it} + \epsilon_{it} \tag{1}$$

A simple example:

$$V_{it} = \beta_{0,t} + \beta_{1t} Size_{it} + \beta_{2t} Location_{it} + \beta_{3t} Pool_{it} + \epsilon_{it} \tag{2}$$

- Any quality change is immediately captured by the model.
- This procedure requires a lot of data: data on property characteristics, periodic appraisals or transaction data.
- Omitted variables, functional form, coefficient instability.

The repeated-sale model

This type of index is computed using data on the same properties transacting at least twice during the observation period. Dummy variables capture the growth in property value over time:

$$ln(\frac{V_{t+n}}{V_t}) = \sum_{i=0}^{n} ln(1+\beta_i) + \epsilon_{it} \quad (3)$$

A simple example:

$$ln(\frac{V_{t+2}}{V_t}) = ln(1+\hat{\beta}_1) + ln(1+\hat{\beta}_2) \quad (4)$$

- The $\hat{\beta}$s represent the estimated capital growth rates in period 1 and 2
- Most of the weakness of the hedonic model are avoided with this methodology.
- Sample selection remains a problem.
- It requires at least two transactions of the same property in the sample.

The Inverse Sale Price Appraisal Ratio

Using the same data one can use a different index calculation methodology. The SPAR

$$Index_t^{EW} = \frac{(1/n_t) \cdot \sum_{i=1}^{n_t} (S_{it}/A_{i0})}{(1/n_{t-1}) \cdot \sum_{i=1}^{n_{t-1}} (S_{it-1}/A_{i0})} \cdot Index_{t-1}^{EW} \tag{5}$$

The Inverse SPAR takes in consideration that the available data has as base year 2007 and not some year in the past

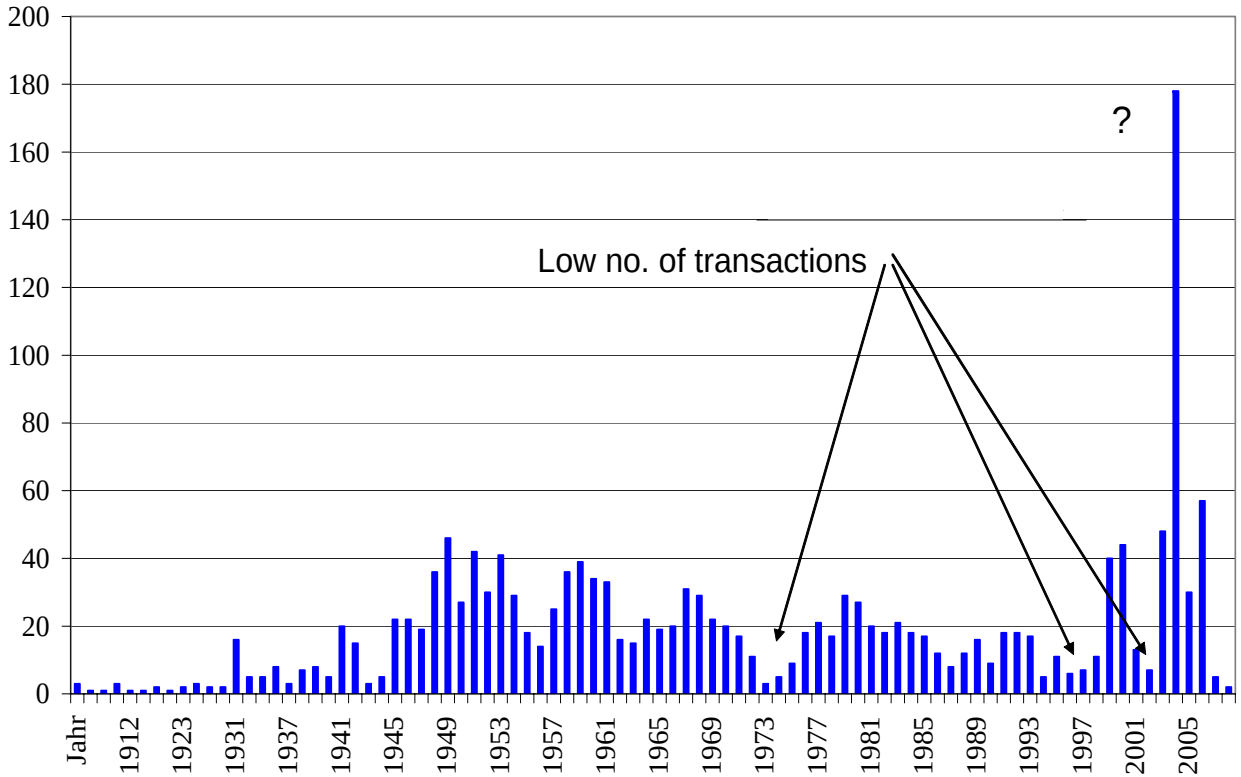
$$Index_{t-1}^{EW} = \frac{(1/n_{t-1}) \cdot \sum_{i=1}^{n_{t-1}} (S_{i,t-1}/A_{i,0})}{(1/n_t) \cdot \sum_{i=1}^{n_t} (S_{i,t}/A_{i,0})} \cdot Index_t^{EW} \tag{6}$$

The available data

Apart from the known advantages of each index type, the available data represents the most stringent constraint. The type and quality of data impose actually the selected index type. The available data (when data collection is completed):

- Purchase price and date of the property
- 2008 appraisal
- Cash-flows (rents and investment) [hopefully]

The available data



How about using an appraised value?

Recall the formula for the repeated-sale index:

$$ln(\frac{V_{t+2}}{V_t}) = ln(1+\hat{\beta}_1) + ln(1+\hat{\beta}_2) \quad (7)$$

If no transaction occurred for a long time one might use *the latest appraisal* instead of the actual (not-known) market value

$$ln(\frac{A_{t+2}}{V_t}) = ln(1+\hat{\beta}_1) + ln(1+\hat{\beta}_2) \quad (8)$$

How does this influence the actual index? Weren't appraisals biased?

The bias in appraised data

This bias exists due to the intrinsic nature of the appraisal business.

- When an appraiser is asked to evaluate a piece of property he will do this by looking at comparable sales.
- If little or no comps are available he will look for past transactions.
- This implies that current valuations are influenced by past prices -¿ smoothing or appraisal bias.
- This problem is more pronounced during low liquidity periods when the lack of transactions forces the appraiser to reach further back in time to find similar transactions.

Using appraised data

Given the empirically observed bias several methods have been developed to un-smooth an appraisal-based time series. Let A_t be the appraised value at time t and $\overline{P}_t$ the average of observed transaction prices at time t. Then one can relate the market price and the appraisal value through:

$$A_t = \alpha \overline{P}_t + \underbrace{(1-\alpha)}_{smoothing} A_{t-1} \tag{9}$$

In my case this problem is not so severe as the data pair i use is made up of one transaction (the buying price) and the latest appraisal. Nevertheless this relation can be used to improve the efficiency of the method by unsmoothing the latest appraisal.

Going from appraisal to transaction

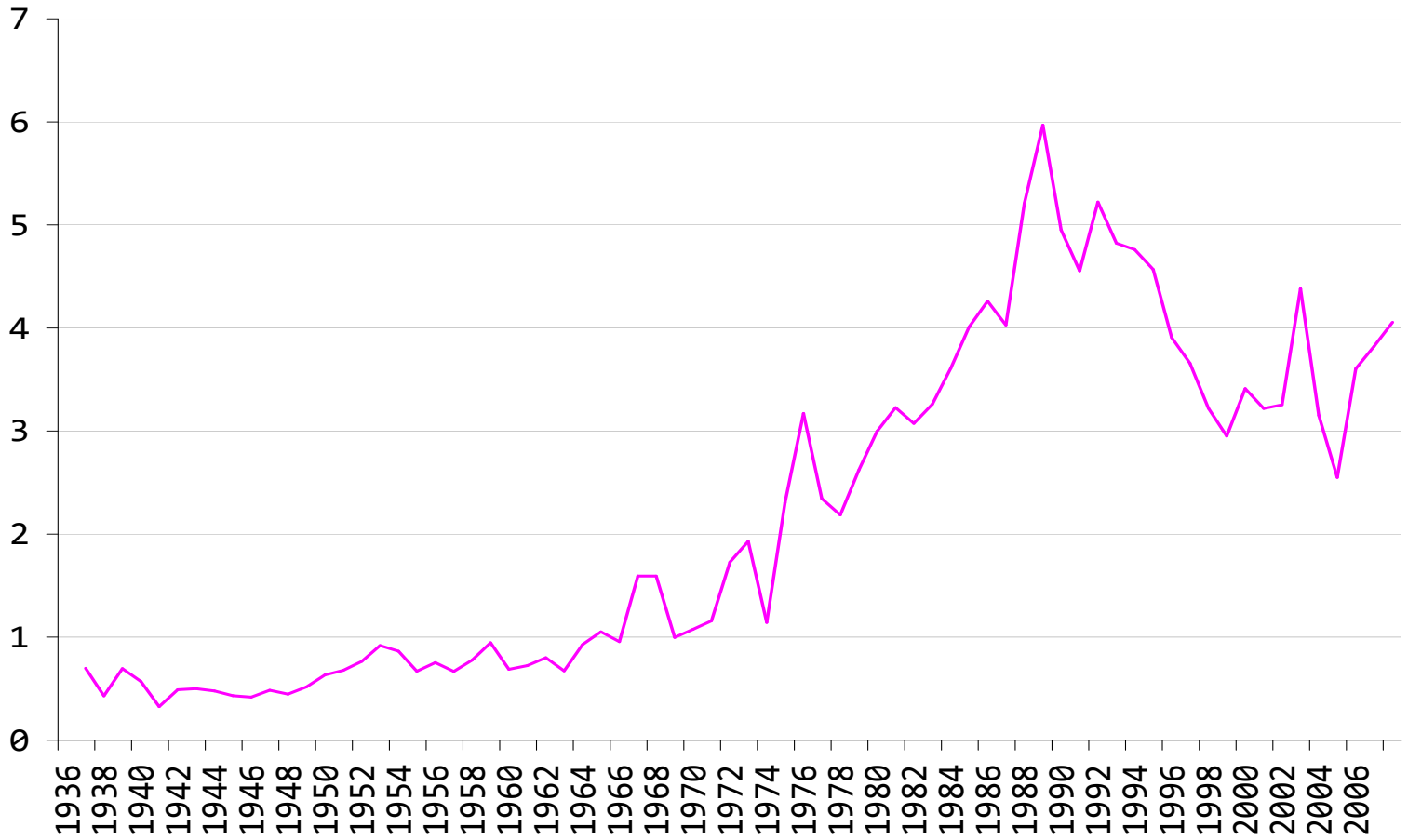
If one can estimate the coefficient α in the previous equation then actually one gets the transaction price out of the appraisal

$$\overline{P}_t = \frac{A_t - (1-\alpha)A_{t-1}}{\alpha} \tag{10}$$

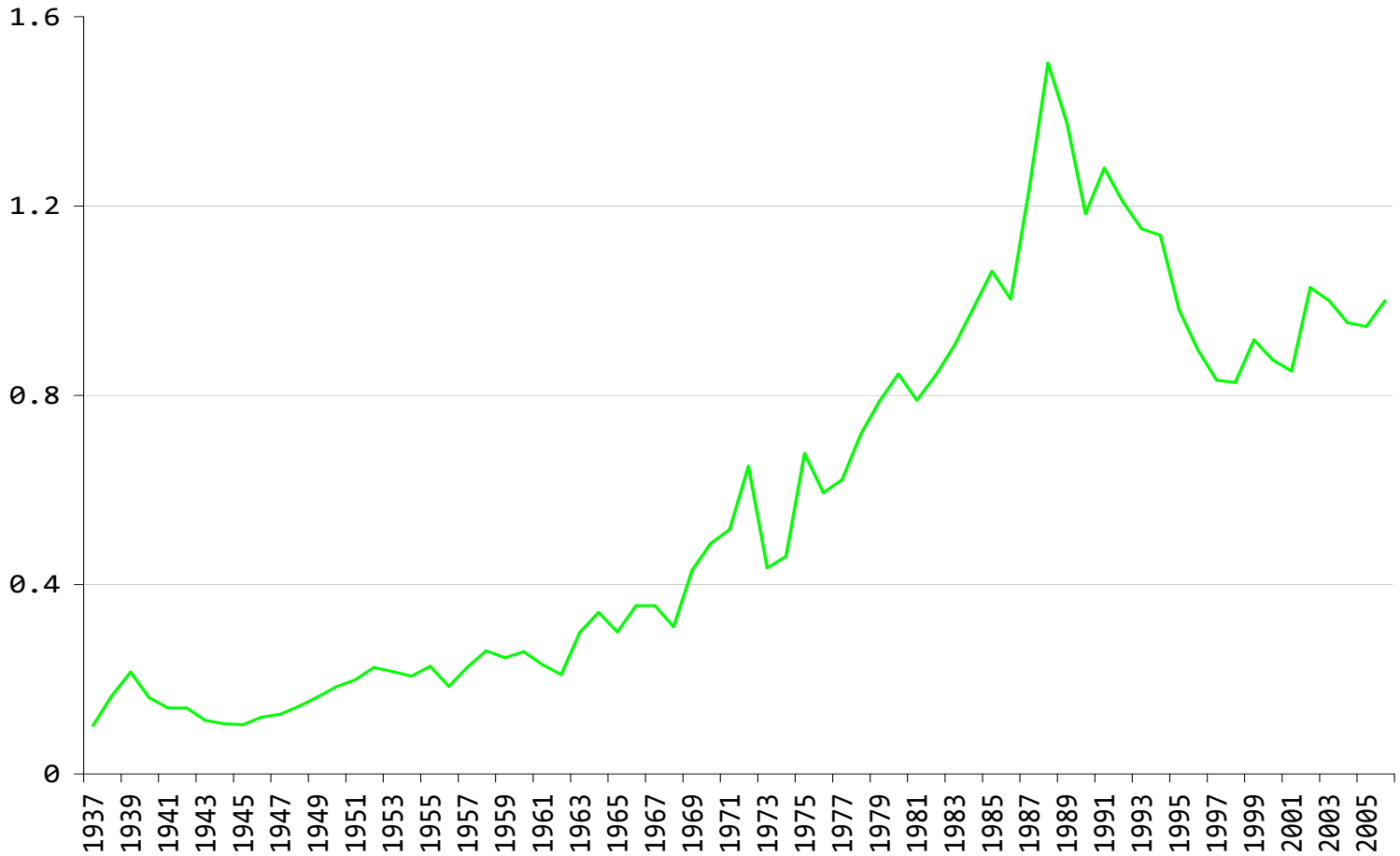
Given a reliable appraisal based index (IPD Switzerland) I can transform most appraisals to get an estimate of the expected market price for a property.

The RMI index

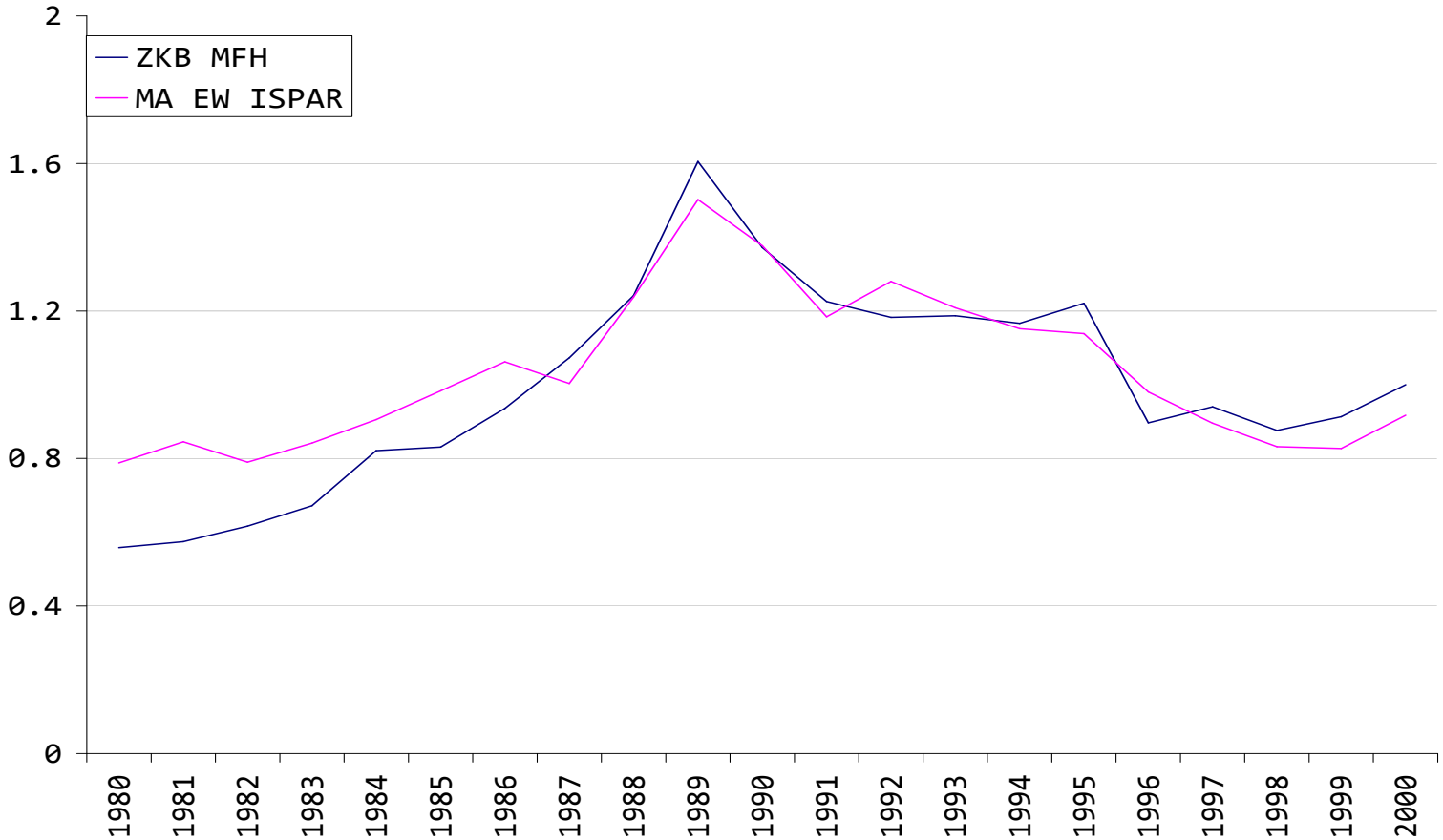
Using the first transaction and latest appraisal values, the RMI is depicted below.



The Inverse Sale Price Appraisal Ratio



The Inverse Sale Price Appraisal Ratio



The Inverse Sale Price Appraisal Ratio

Index	Mean	Volatility	Skewness	Kurtosis
VW ISPAR 1937-2007	0.041	0.23	0.45	1.03
EW ISPAR 1937-2007	0.029	0.19	-0.21	3.06
RMI 1937-2007	0.053	0.25	0.98	2.5
VW ISPAR 1980-2000	0.004	0.12	1.11	1.61
EW ISPAR 1980-2000	0.012	0.10	0.39	-0.51
ZKB MHF 1980-2000	0.03	0.12	-0.32	0.84
RMI 1980-2000	0.006	0.12	0.67	-0.16
VW ISPAR 1988-2007	0.012	0.12	1.12	0.69
EW ISPAR 1988-2007	0.005	0.11	0.94	0.02
IAZI 1988-2007	-0.006	0.04	-0.06	-1.02
RMI 1988-2007	0.001	0.17	0.89	0.74

Table: Summary statistics of the simple yearly returns

Conclusion and further work

- The repeated-measure methodology produces sensible results even when using appraised value and not transaction values.
- The un-smoothing procedure is expected to improve the quality of the estimated returns for the most recent period.