
Risk Analysis of the Real Estate Market in Switzerland (Diagnostic as of 2014-Q2)

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Background

This work is a collaboration between the chair of Entrepreneurial Risks at the Department of Management, Technology and Economics (D-MTEC) of ETH Zurich and comparis.ch. It has benefited from funding by the Commission for Technology and Innovation (CTI) in its launching phase and is partially funded by comparis.ch. The goal of this project is to study the real estate market in Switzerland to empower the buyers and sellers of this market with critical information on price dynamics in every Swiss district.

Data and Methodology

The data used in this analysis was collected by comparis.ch between 1 January 2005 and 30 June 2014. The property market division of comparis.ch gathers data from the 17 largest property portals in Switzerland, creating a rich view on the market, but also introducing a large number of duplicate ads (over 5.2 million records are present in the raw data). These duplicate ads advertise the same property, during the same period, and sometimes, with conflicting information. Within the scope of this study, the identification of the duplicates has been crucial, as they could potentially affect the price indices. Before performing any analysis, duplicates in the aggregated data set have been automatically removed using a classification procedure based on the Support Vector Machine (SVM) algorithm and string distance measures. The application of the de-duplication procedure to the comparis.ch database classified approximately 590'000 apartments and 650'000 houses for sale between 2005-Q1 and 2014-Q2, which amount to a total of about 1'240'000 residential properties. This does not represent all the properties that were on the market in this period. However, it is assumed that the data collected by comparis.ch represents the market very closely. One important fact about this data set is that the prices are asking prices and not the final transaction prices.

We have studied the development of prices in each of the 166 Swiss districts (see disclaimer). In order to analyze the market, the ads in each district were categorized by type (i.e. apartment or house), and subsequently subdivided in three groups, according to the number of rooms, as described in Table 1. The properties in each subgroup were aggregated quarterly using the median asking price and the median asking price per square meter for houses and apartments respectively.

Table 1: Categorization of properties based on the number of rooms.

Property Type	Houses		Apartments	
	Median Asking Price		Median Asking Price per Square Meter	
Measure	Min # of Rooms	Max # of Rooms	Min # of Rooms	Max # of Rooms
Small	1	4.5	1	3.5
Medium	5	6.5	4	5.5
Large	7+		6+	

Real Estate Market in Switzerland

Figure 1 shows the change in median asking price per square meter between the first quarter of 2007 and the second quarter of 2014 for all apartments listed on comparis.ch during this period. The district of Entremont, marked in red, shows the highest price increase, where the median asking price of apartments per square meter has increased by 120% since the first quarter of 2007.

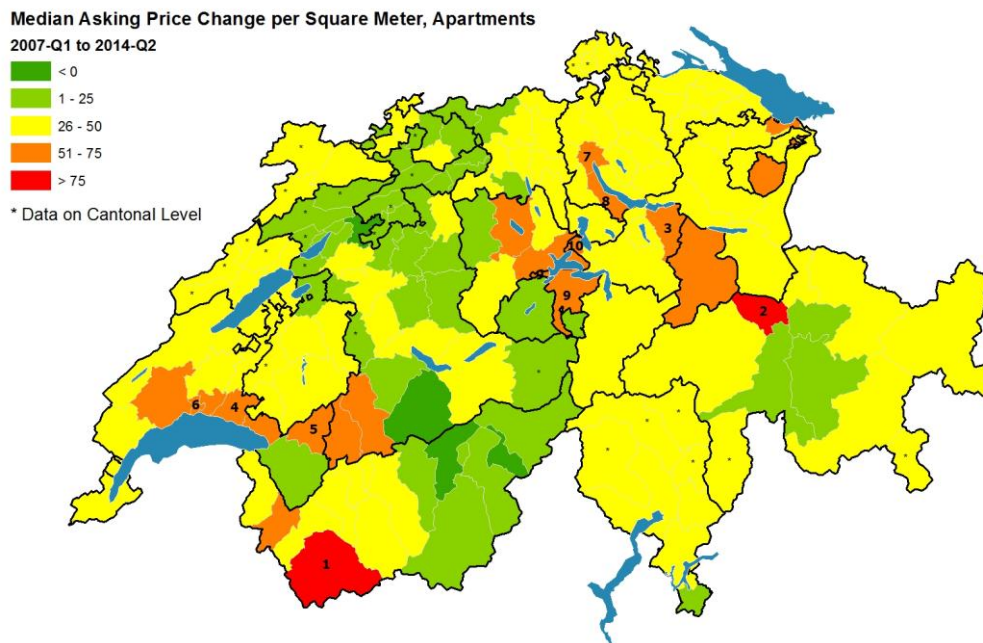


Figure 1: Change in median asking price per square meter for apartments in all Swiss districts between 2007-Q1 and 2014-Q2.

The regions marked with “*” represent the districts with not enough listings in either 2014-Q2 or 2007-Q1. The cantonal median price change per square meter values are shown for those districts. The top ten districts with the highest increase in the apartments’ asking price per square meter between 2007-Q1 and 2014-Q2 are labeled in Figure 1 and listed in Table 2.

Table 2: Top 10 districts with the highest increase in median asking price per square meter for apartments between 2007-Q1 and 2014-Q2.

	District Name	Median increase in asking price per square meter
1	Entremont	120%
2	Imboden	77%
3	March	67%
4	Lavaux-Oron	66%

5	Riviera-Pays-d'Enhaut	65%
6	Ouest lausannois	64%
7	Zürich	62%
8	Horgen	62%
9	Nidwalden	61%
10	Küssnacht (SZ)	59%

Figure 2 shows the median asking price per square meter for apartments as of 2014-Q2. The districts with "*" marks represent the districts with not enough listings in the second quarter of 2014. The cantonal median prices per square meter for apartments are shown for these districts. The top ten most expensive apartments as of 30 June 2014 are labeled in Figure 2 and listed in Table 3.

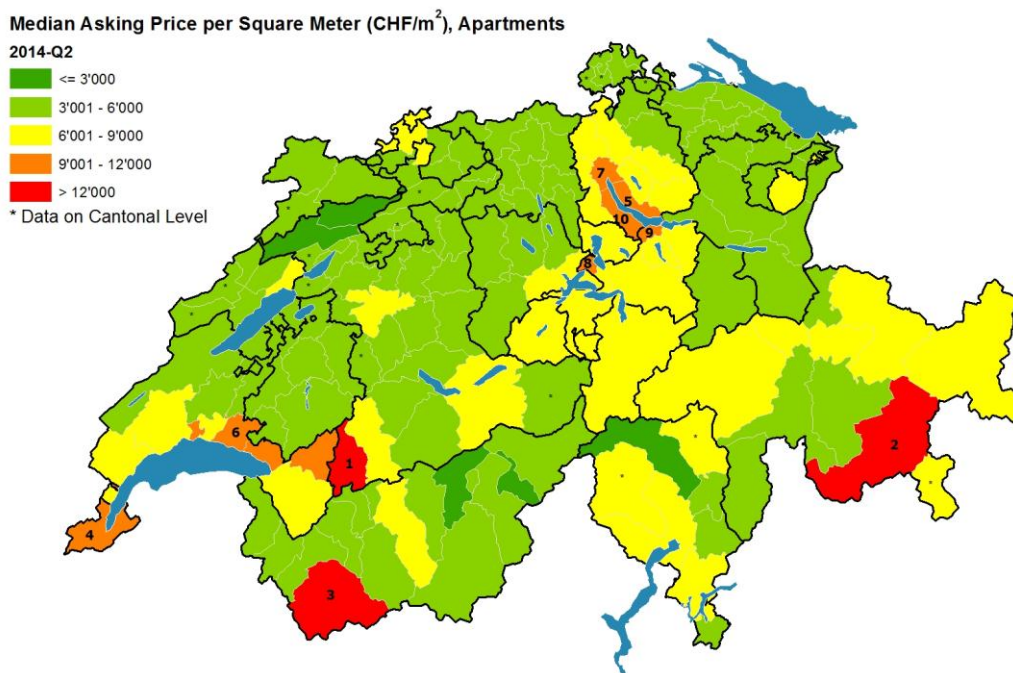


Figure 2: Median asking price per square meter for apartments in all Swiss districts as of 2014-Q2.

Table 3: Top 10 districts with the highest median asking price per square meter for apartments as of 2014-Q2.

	District Name	Median asking price per square meter (CHF/m ²)
1	Saanen	15'500
2	Maloja	12'500
3	Entremont	12'000
4	Genève	11'500
5	Meilen	11'000
6	Lavaux-Oron	11'000
7	Zürich	10'500
8	Küssnacht (SZ)	10'000
9	Höfe	10'000
10	Horgen	10'000

The median asking prices for medium size houses (5 to 6.5 rooms) as of 2014-Q2 are shown in Figure 3. Districts with "*" marks represent the districts with not enough listings in the second quarter of 2014. The cantonal median asking prices for medium size houses are shown for these districts. The

top ten currently most expensive medium size houses are labeled in Figure 3 and listed in Table 4.

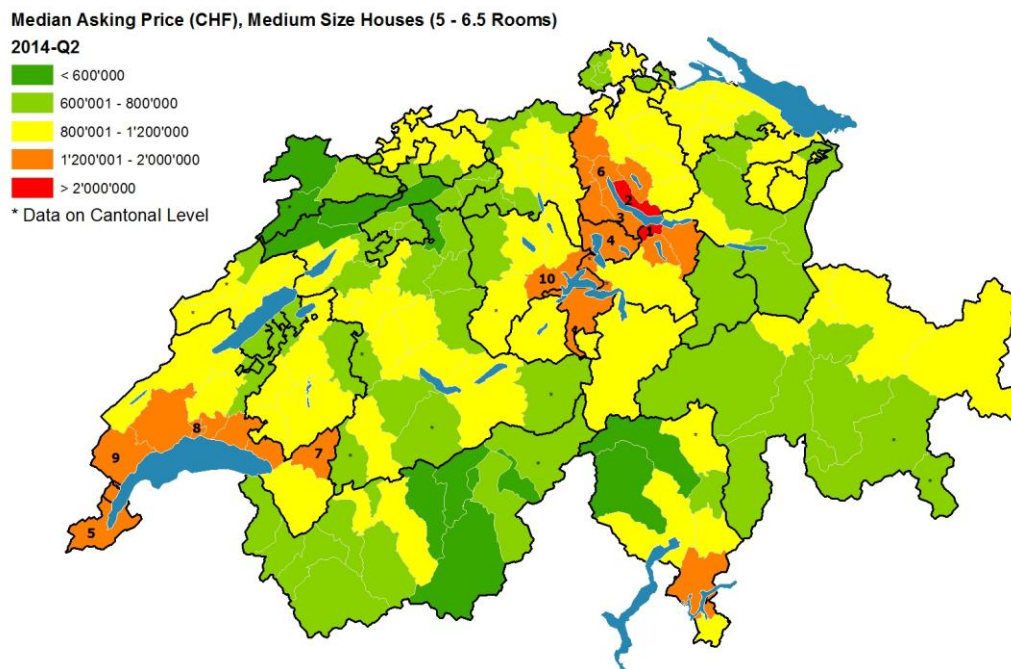


Figure 3: Median asking price of medium size houses (5 to 6.5 rooms) in all Swiss districts as of 2014-Q2.

Table 4: Top 10 districts with the highest asking price for medium size houses as of 2014-Q2.

	District Name	Median asking price (CHF)
1	Höfe	2'100'000
2	Meilen	2'050'000
3	Horgen	1'650'000
4	Zug	1'650'000
5	Genève	1'650'000
6	Zürich	1'600'000
7	Riviera-Pays-d'Enhaut	1'550'000
8	Ouest lausannois	1'550'000
9	Nyon	1'550'000
10	Luzern	1'550'000

The Log-Periodic Power Law (LPPL) Model

The term “bubble” refers to a situation in which excessive future expectations cause prices to rise above long-term trends and/or above what would be justified by rent prices, incomes, demographics and other fundamental factors. Sornette and Woodard (2010) illustrate the concept of housing price bubble as follows: "During a housing price bubble, homebuyers think that a home that they would normally consider too expensive for them is now an acceptable purchase because they will be compensated by significant further price increases. They will not need to save as much as they otherwise might, because they expect the increased value of their home to do the saving for them. First time homebuyers may also worry during a housing bubble that if they do not buy now, they will not be able to afford a home later." Furthermore, the expectation of large price increases may have a strong impact on demand if people think that home prices are very unlikely to fall, and certainly not likely to fall for long, so that there is little perceived risk associated with an investment in a home.

We employed the log periodic power law (LPPL) bubble model to diagnose the risk of real estate bubbles in Switzerland. The LPPL model diagnoses a bubble as a transient, faster than exponential growth process, decorated with ever increasing oscillations representing the low frequency developing price volatility. Speculative bubbles are caused by 1) precipitating factors that change public opinion about markets or that have an immediate impact on demand and 2) amplification mechanisms that take the form of price-to-price positive feedback: the larger the price, the higher the demand and ... the larger the price! The behavior of the market no longer reflects any real underlying value and a bubble is born. According to the LPPL model, a crash occurs because the market has entered an unstable phase and any small disturbance or process may reveal the existence of the instability. Like a ruler held up vertically on your finger, any small disturbance can trigger the fall. The LPPL model diagnoses also the end of bubbles, which signals a change of regime, in which the prices stop rising, and take a different dynamics. This can be a swift correction, like a crash, but also a slow deflation or stagnation. In fact, a less violent and slower end of bubbles is a better representative characteristic of real estate markets since properties are durable goods that people tend to hold whenever falling prices are observed. The tendency to hold is also due to significant friction and transaction costs. In this case, the crash is more in the volume of transactions than in the price itself, which may take a long time to show a significant correction. Moreover, a crash is not a particular event but is characterized by a probability distribution: the critical time is the most probable time of a crash (the end of the bubble). This is an essential ingredient for the bubble to exist, as it is only rational for financial agents to continue investing when the risk of the crash to happen is compensated by the positive return generated by the financial bubble, and when there exists a finite probability for the bubble to disappear smoothly. In other words, the bubble is only possible when the public opinion is not certain about its end and when its end may be smooth. Many examples of forecasting financial and real estate bubbles with the LPPL model have been reported and listed at http://www.er.ethz.ch/publications/finance/bubbles_empirical.

We applied the LPPL methodology to all subcategories of properties defined in Table 1, as well as to the aggregated index for apartments over the period of 2005-Q1 to 2014-Q2. The following classification is used to express the status of the districts based on the LPPL analysis:

Critical: a strong bubble signal from the LPPL analysis. This is an indication that a change of regime is imminent. The bracket of the expected time of the change of regime is only reported for this status.

To Watch: a bubble signal from the LPPL analysis. However, the signal is not as strong as the “Critical” case.

To Monitor: This status is only obtained after a district has been previously depicted as a “Critical” or “To Watch” district. The price could be increasing without (anymore) a bubble signal or decreasing but there are not yet enough data points to declare a confirmation of a change of regime.

Regime Change: This status is only obtained after a district has been previously depicted as a “To Monitor” district and the latest data points confirm a change of regime.

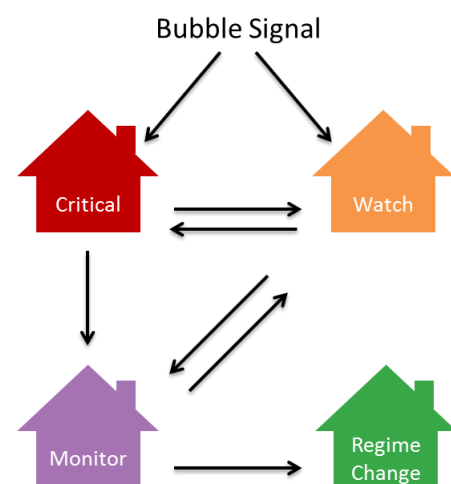


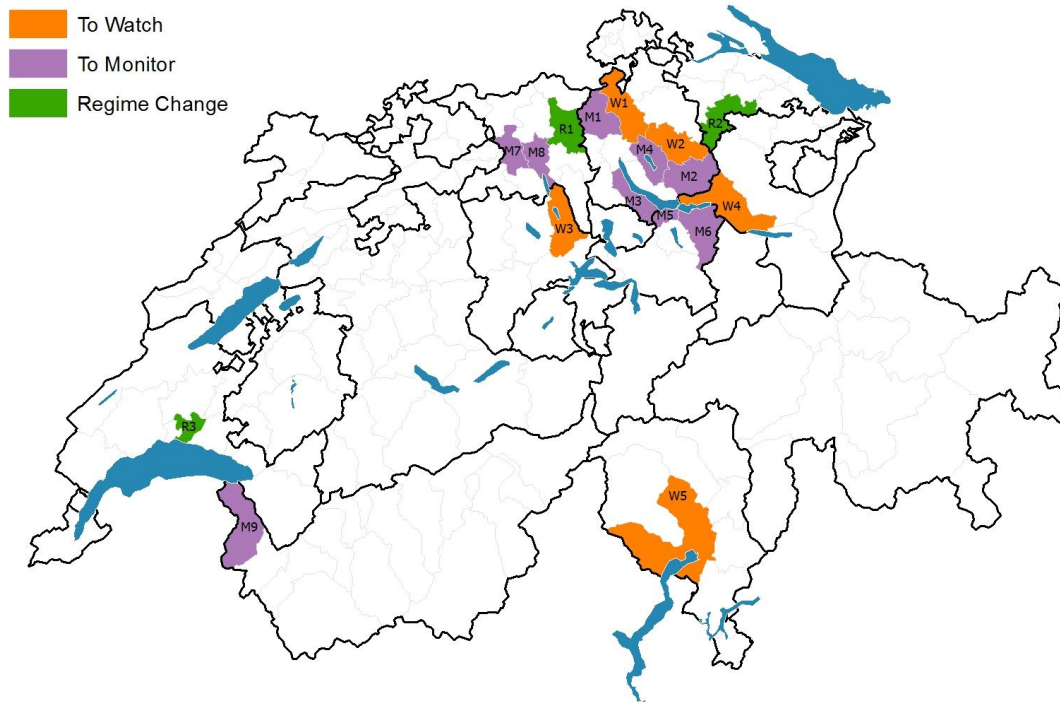
Figure 4: Classification of the districts.

- A “Critical” district can downgrade into a “To Watch” (respectively a “To Monitor” district), reflecting a weakening of the presence/strength of the bubble signals (respectively a preliminary diagnostic of a change of regime).
- A “To Watch” district can become a “Critical” (respectively a “To Monitor” district) when the strength of the bubble indicators increases (respectively when there is evidence of an on-going change of regime).
- A “To Monitor” district can become a “To Watch” (respectively a “Regime Change” district) when the presence of bubble signals is more strongly confirmed (respectively when the price dynamics has validated the end of the bubble).

The results of the LPPL analysis on the real estate market in Switzerland using the comparis.ch data from 2005-Q1 until 2014-Q2 are summarized in Figure 5 and are as follows:

- Critical: currently, none of the districts show signals that fall in this category.
- To Watch: districts labeled W1 through W5 should be watched. The asking price dynamics of apartments in the district of Bülach (all/medium/small size apartments, labeled W1) is downgraded from “Critical” in 2013-Q4 to “To Watch” as of 2014-Q2. The LPPL analysis still reports a bubble signal for this district. However, the signal is not as strong as it was in the previous report. Other districts that fall in this category are Pfäffikon (medium size apartments, labeled W2), Hochdorf (medium/small size apartments, labeled W3), See-Gaster (all/medium size apartments, labeled W4), and Locarno (all/small size apartments, labeled W5). There is no new “To Watch” district compared to what was reported in 2013-Q4.
- To Monitor: districts labeled M1 through M9 should be monitored. The price dynamics in the district of Dielsdorf (all/medium size apartments, labeled M1) no longer seems to follow a super exponential trend (as was observed in 2013-Q4) and its status is downgraded from “To Watch” to “To Monitor”. Other districts in this category are Hinwil (medium size houses/all size apartments, labeled M2), Horgen (all size apartments, labeled M3), Uster (all size apartments, labeled M4), Höfe (medium size apartments, labeled M5), March (all size apartments, labeled M6), Aarau (medium size houses/all size apartments, labeled M7), Lenzburg (medium size houses, labeled M8), and Monthey (all size apartments, labeled M9).
- Regime Change: The price dynamics in the districts of Baden (all size apartments, labeled R1), Lausanne (all size apartments, labeled R2), and Münchwilen (medium size houses/all size apartments, labeled R3) clearly show a change of regime. These districts were previously reported as “Critical” and later downgraded to “To Monitor”.

Detailed results of these analyses are presented in Appendices A through D, where the developments in the asking prices along with possible LPPL scenarios (when applicable) are shown. It should be noted that the LPPL scenarios in Appendix A are indicators of possible critical times (80 percent confidence intervals, shaded regions) in the corresponding districts and are not intended as future price indicators. In addition, the development of the reported districts in 2013-Q2, 2013-Q4, and 2014-Q2 can be found in Appendix E.



Label	District Name	Status	Property Type	Property Size	Critical Time
W1	Bülach	To Watch	Apartments	All/Medium/Small	-
W2	Pfäffikon	To Watch	Apartments	Medium	-
W3	Hochdorf	To Watch	Apartments	Medium/Small	-
W4	See-Gaster	To Watch	Apartments	All/Medium	-
W5	Locarno	To Watch	Apartments	All/Small	-
M1	Dielsdorf	To Monitor	Apartments	All/Medium	-
M2	Hinwil	To Monitor	Houses/Apartments	Medium/All	-
M3	Horgen	To Monitor	Apartments	All	-
M4	Uster	To Monitor	Apartments	All	-
M5	Höfe	To Monitor	Apartments	Medium	-
M6	March	To Monitor	Apartments	All	-
M7	Aarau	To Monitor	Houses/Apartments	Medium/All	-
M8	Lenzburg	To Monitor	Houses	Medium	-
M9	Monthey	To Monitor	Apartments	All	-
R1	Baden	Regime Change	Apartments	All	-
R2	Münchwilen	Regime Change	Houses/Apartments	Medium/All	-
R3	Lausanne	Regime Change	Apartments	All	-

Figure 5: Results of the LPPL analysis as of 2014-Q2.

The median asking price per square meter for apartments in two geopolitically important Swiss districts (city of Zürich and the canton of Geneva) are presented in Figure 6. The developments of prices in these regions have exhibited a steady and robust increase from 2008 to 2012 for the city of Zürich and from 2005 to 2012 for the canton of Geneva, followed by a different dynamics in which prices have either stagnated or decreased.

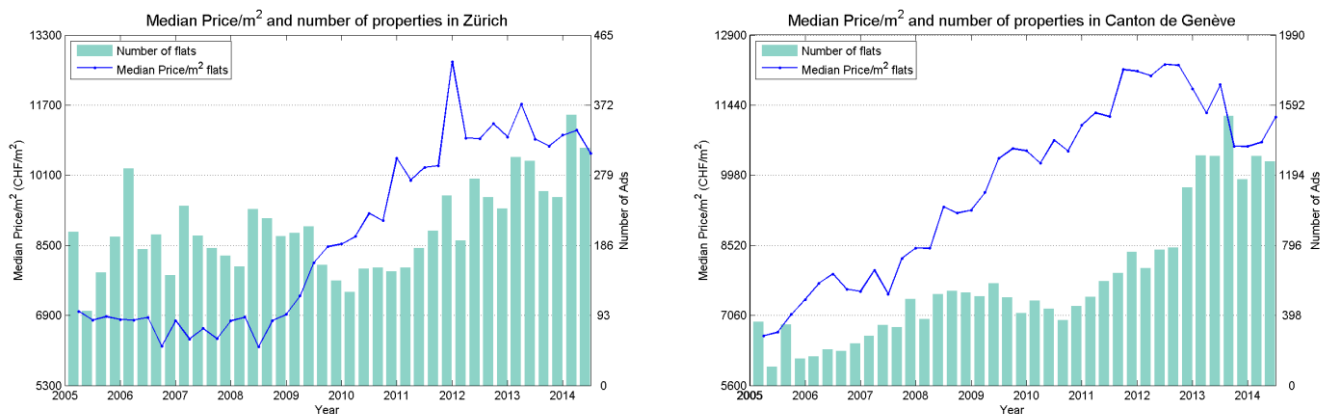


Figure 6: Median asking price per square meter for apartments. Left: City of Zürich, Right: Canton of Geneva.

Although the results reported here support the view that the market is rather stagnating, we emphasize that the situation in Switzerland is highly dependent on international factors. We performed a detailed analysis to identify the macroeconomic factors most correlated to the Swiss national house price index (Ardila et. al, 2014)¹. The top eight macroeconomic time series, out of a set of 27 variables, that best describe the price dynamics are (the order does not imply weight of the factor): 1) London Libor CHF 12 months; 2) Variable mortgage rate; 3) Mortgage loans (private households); 4) Europe EUR/ Switzerland CHF; 5) Foreign direct investment – inflows; 6) Swiss direct investment - outflows; 7) Swiss GDP growth rate; and 8) Foreign population in Switzerland.

The identification of these factors highlights the predominant role that the international situation has played in the development of the aggregated Swiss house price index during the last decade. Arguably, these variables have moved according to phenomena exogenous to the Swiss economy, such as the sub-prime crisis, and the European sovereign debt crisis, as well as the increasing number of foreigners in Switzerland.

Recommendations

In the absence of an exogenous shock, the “Regime Change” districts offer potential buying opportunities as the price dynamics have already changed into a new regime. The households who can afford to wait, may choose to postpone the purchase of their home in the “To Watch” and “To Monitor” districts, in the hope of profiting from a slight deflation.

Disclaimer

The districts map provided by the Swiss Federal Statistical Office (Bundesamt für Statistik, BFS) based on 2009 districts' divisions has been used as a basis for performing this study. The Swiss districts' borders regularly evolve (districts merge or split) and current districts name and borders might vary from the ones used in the presented maps. Therefore, the borders plotted in the maps presented in this study should be consulted when referring to the districts' names and the appropriate map(s) should always be accompanied with the district name when referring to the status of a district in this report.

¹ Ardila, D., Sanadgol, D., Cauwels, P., & Sornette, D. (2014). Identification and Critical Time Forecasting of Real Estate Bubbles in the USA and Switzerland. *Swiss Finance Institute Research Paper*, (14-44).

Appendix A: Review of 2014-Q2 “To Watch” Districts.

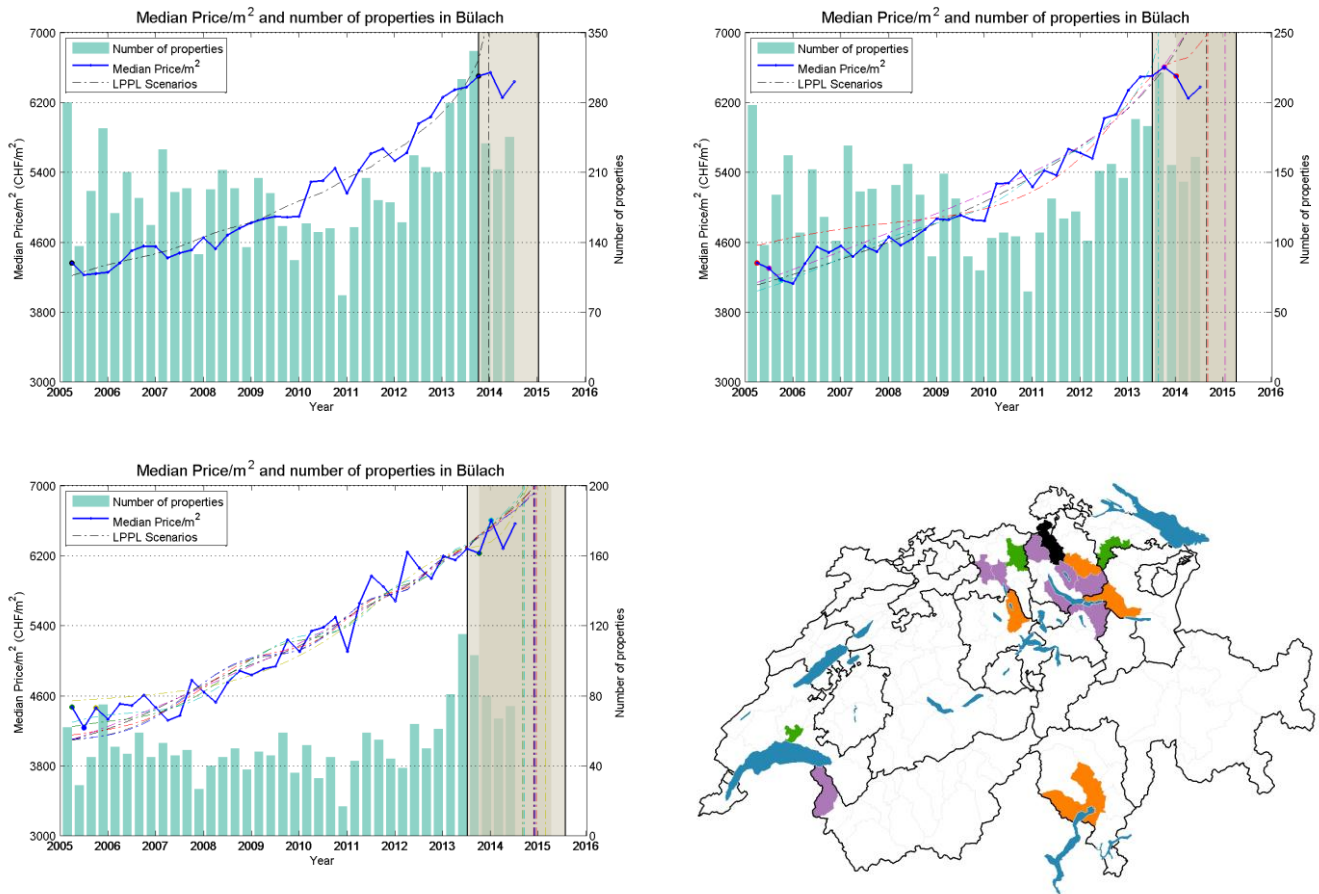


Figure A. 1: District: Bülach, Status: To Watch, Property type: all apartments (top left), medium size apartments (top right), small size apartments (bottom left).

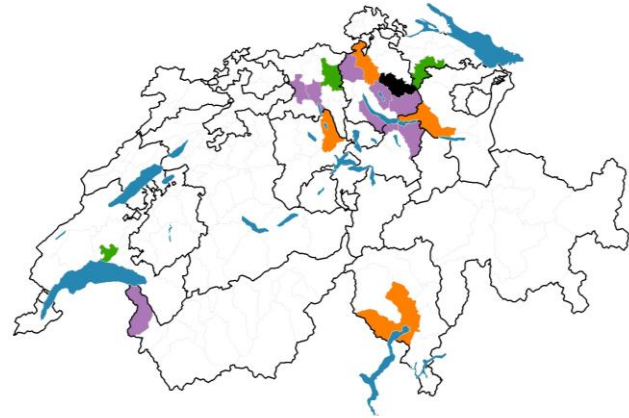
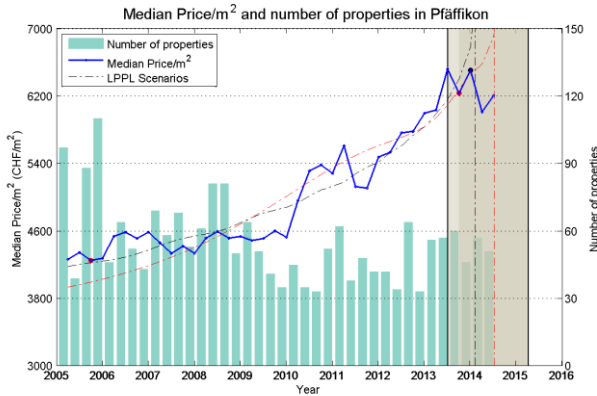


Figure A. 2: District: Pfäffikon, Status: To Watch, Property type: medium size apartments.

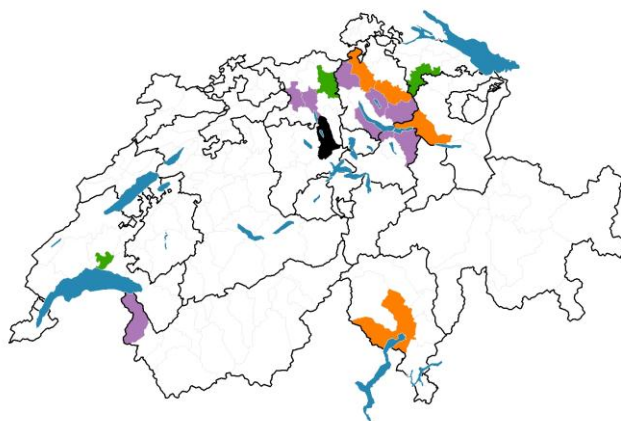
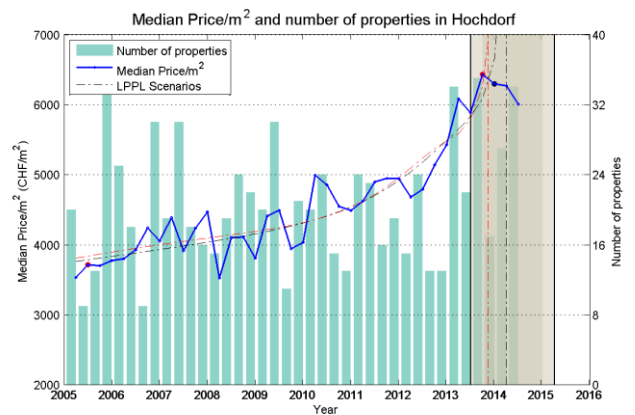
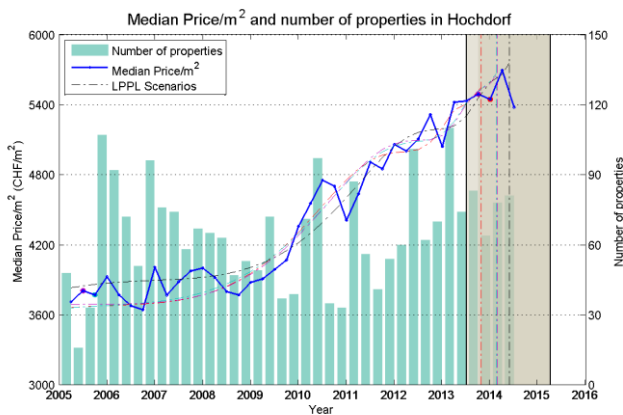


Figure A. 3: District: Hochdorf, Status: To Watch, Property type: medium size apartments (top left), small size apartments (top right).

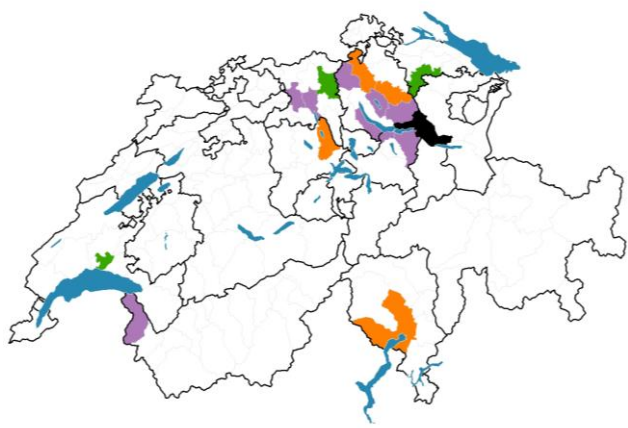
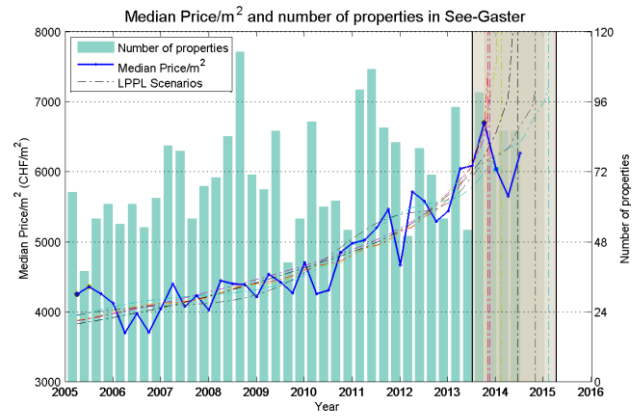
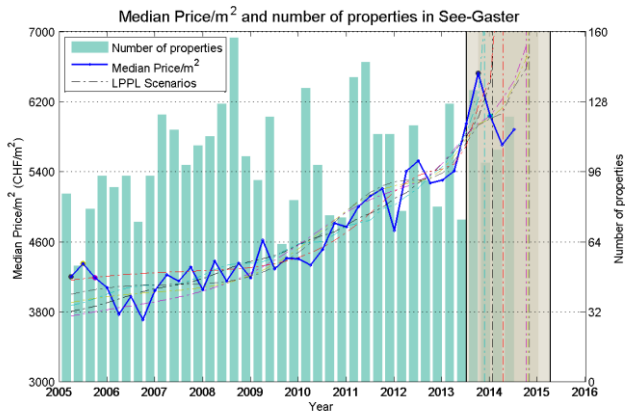


Figure A. 4: District: See-Gaster, Status: To Watch, Property type: all apartments (top left), medium size apartments (top right).

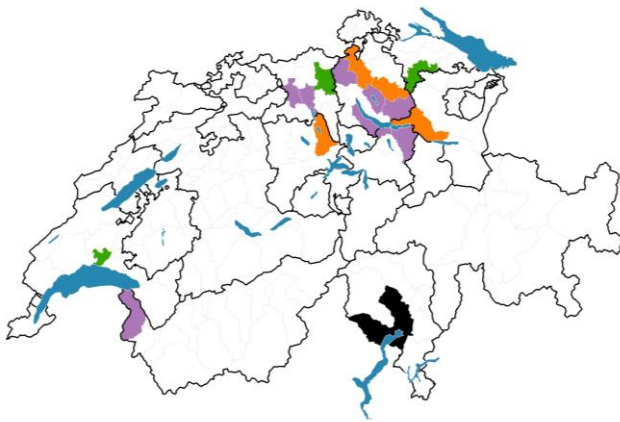
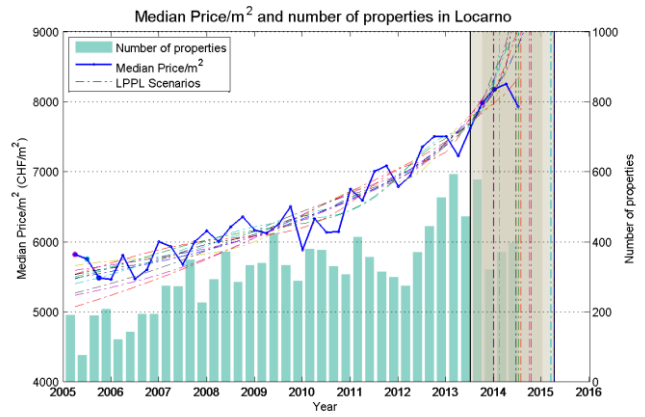
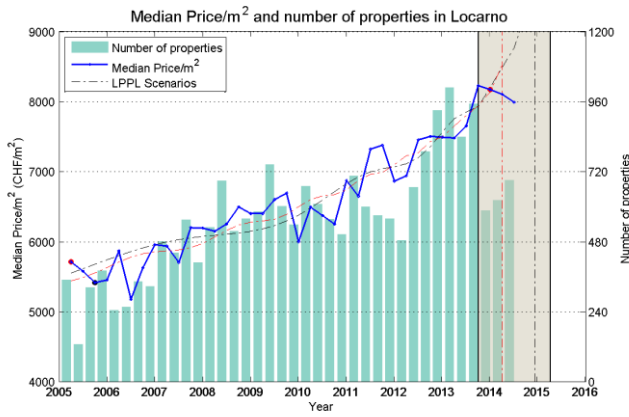


Figure A. 5: District: Locarno, Status: To Watch, Property type: all apartments (top left), small size apartments (top right).

Appendix B: Review of 2014-Q2 “To Monitor” Districts.

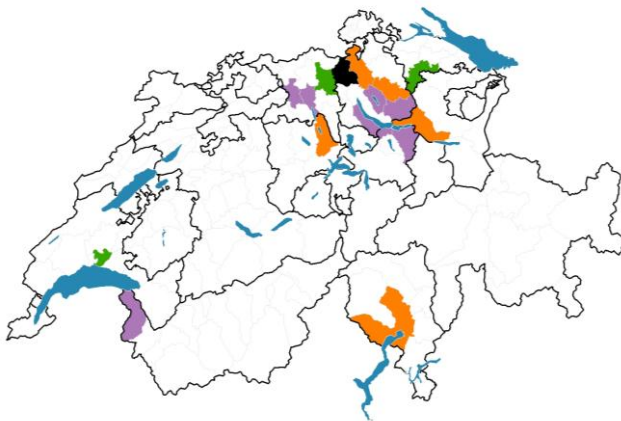
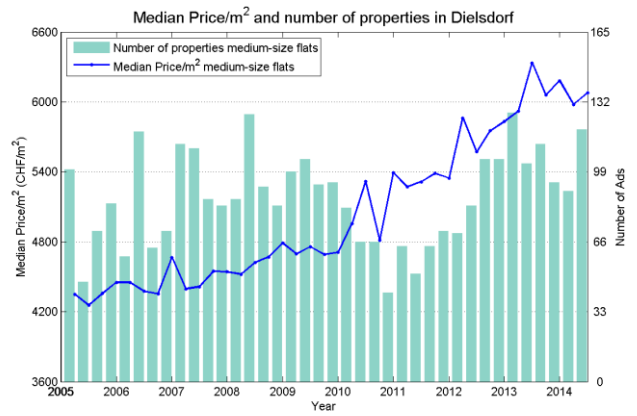
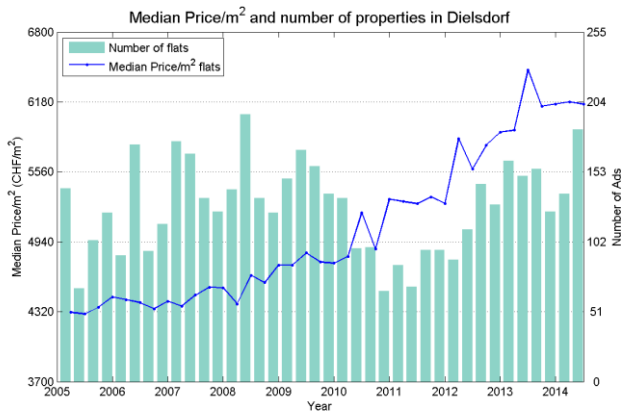


Figure B. 1: District: Dielsdorf, Status: To Monitor, Property type: all apartments (top left), medium size apartments (top right).

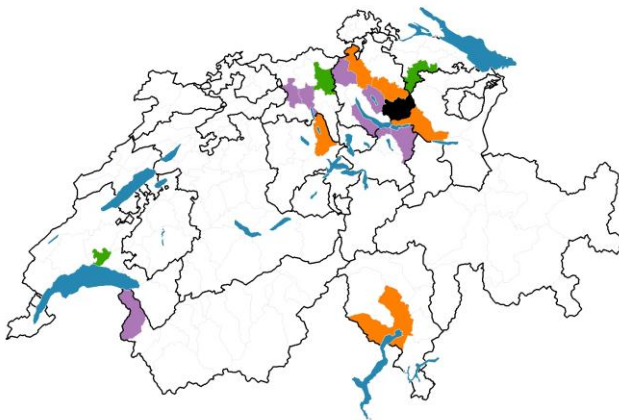
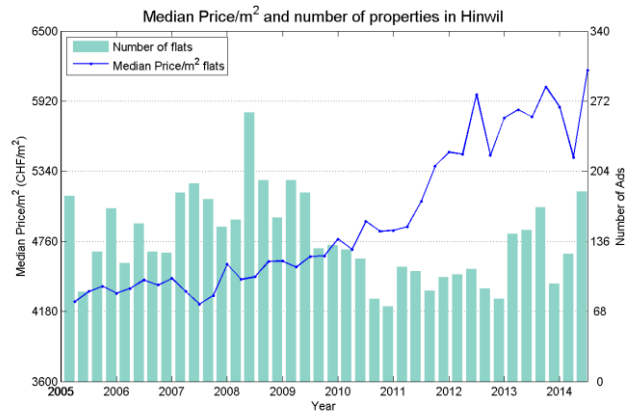
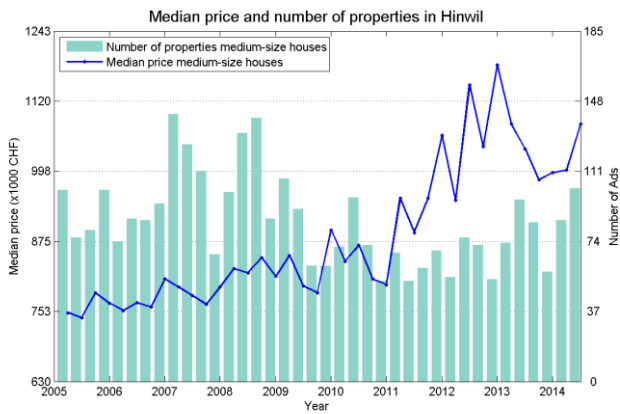


Figure B. 2: District: Hinwil, Status: To Monitor, Property type: medium size houses (top left), all apartments (top right).

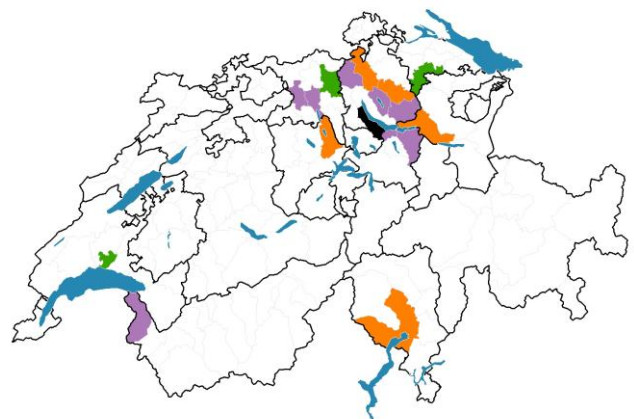
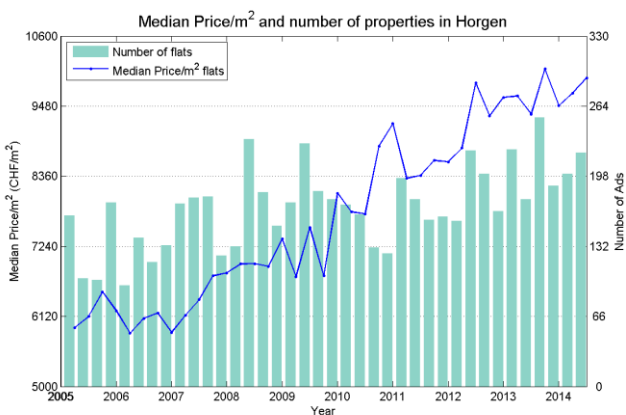


Figure B. 3: District: Horgen, Status: To Monitor, Property type: all apartments.

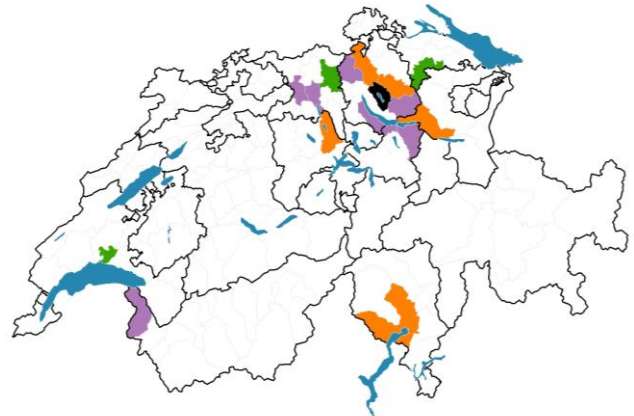
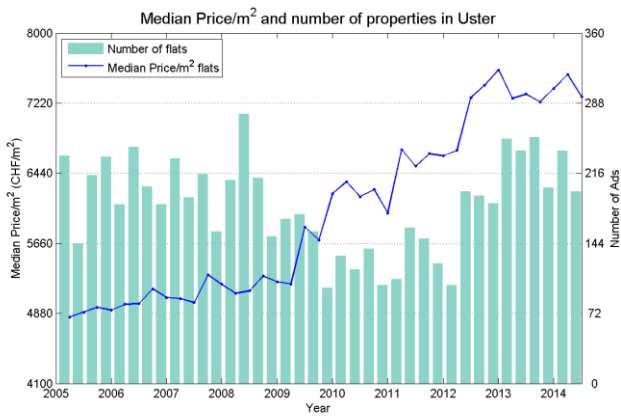


Figure B. 4: District: Uster, Status: To Monitor, Property type: all apartments.

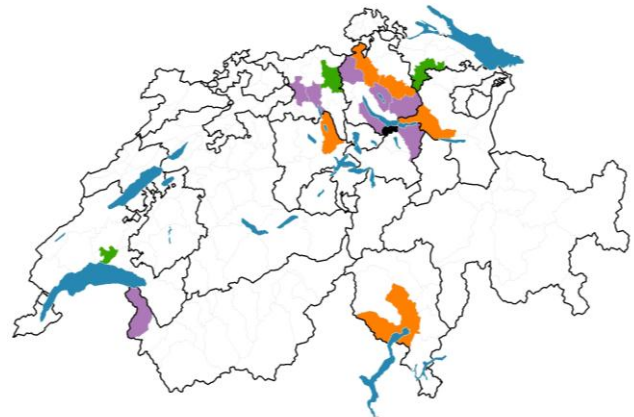
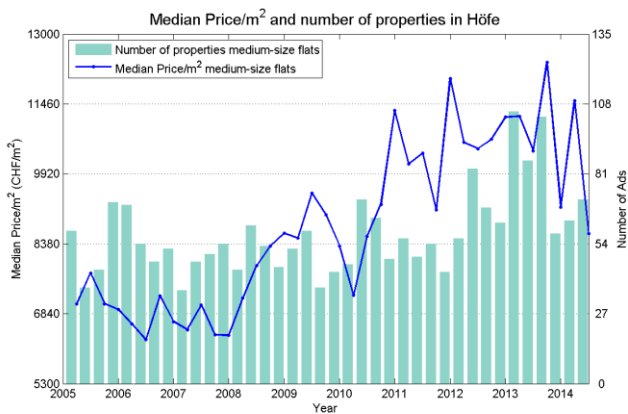


Figure B. 5: District: Höfe, Status: To Monitor, Property type: medium size apartments.

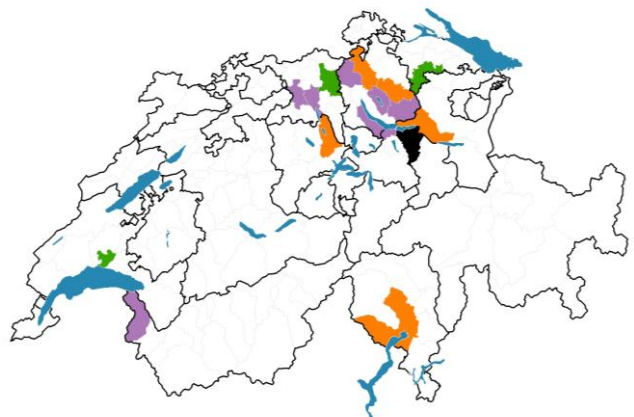
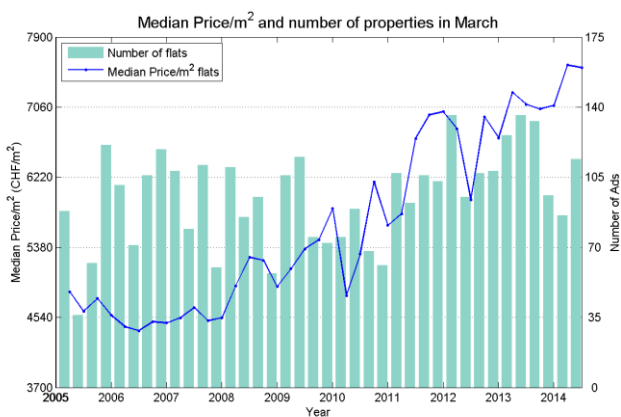


Figure B. 6: District: March, Status: To Monitor, Property type: all apartments.

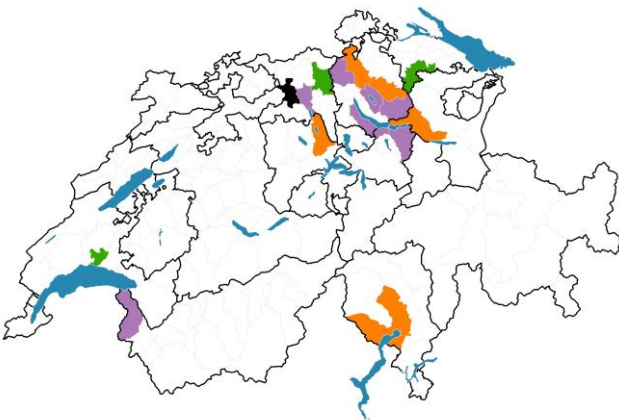
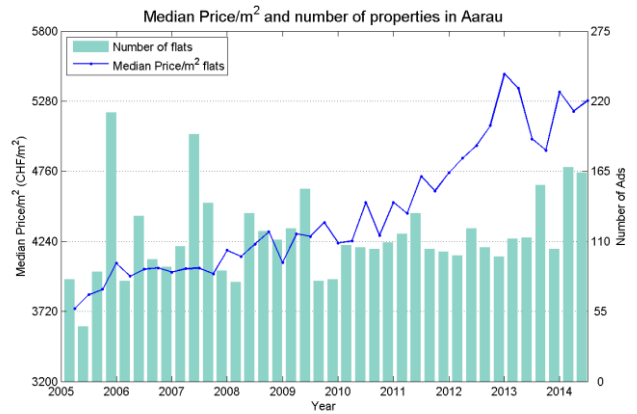
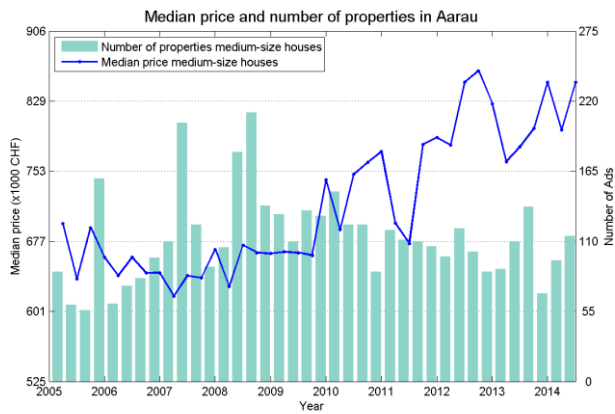


Figure B. 7: District: Aarau, Status: To Monitor, Property type: medium size houses (top left), all apartments (top right).

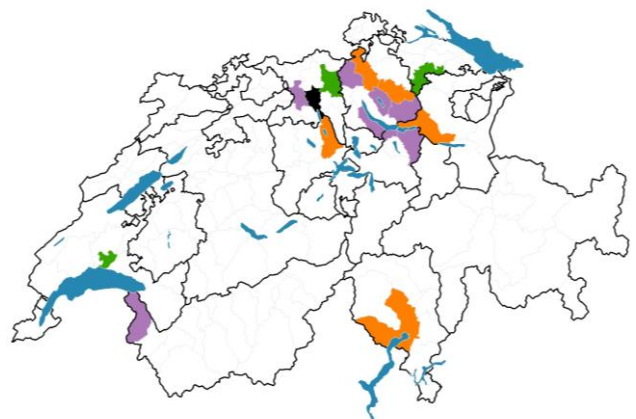
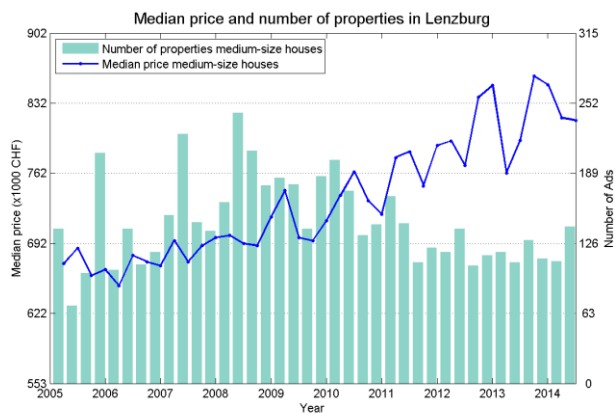


Figure B. 8: District: Lenzburg, Status: To Monitor, Property type: medium size houses.

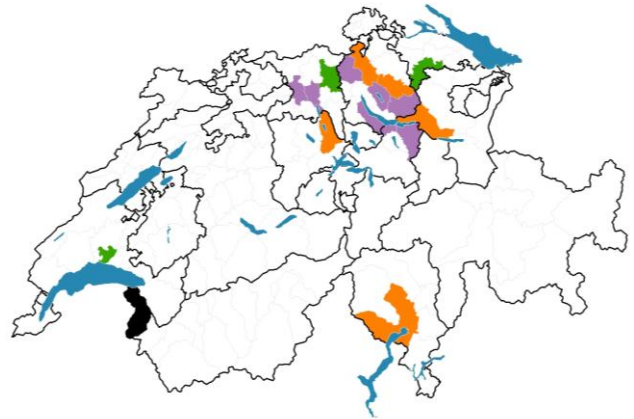
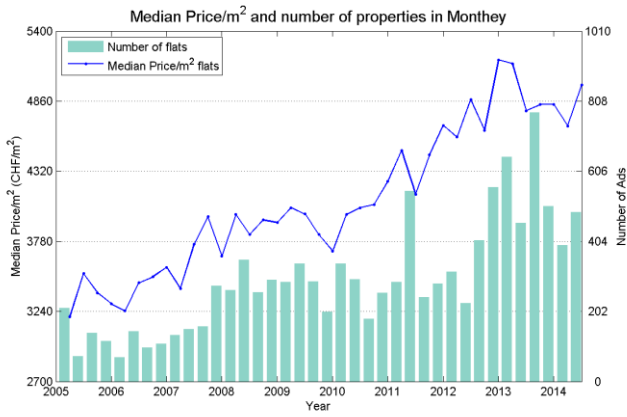


Figure B. 9: District: Monthey, Status: To Monitor, Property type: all apartments.

Appendix C: Review of 2014-Q2 “Regime Change” Districts.

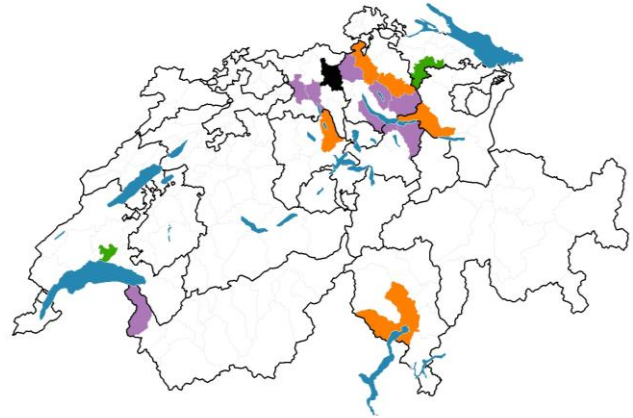
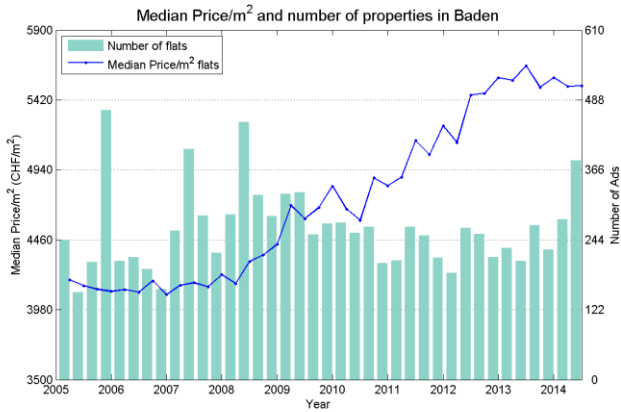


Figure C. 1: District: Baden, Status: Regime Change, Property type: all apartments.

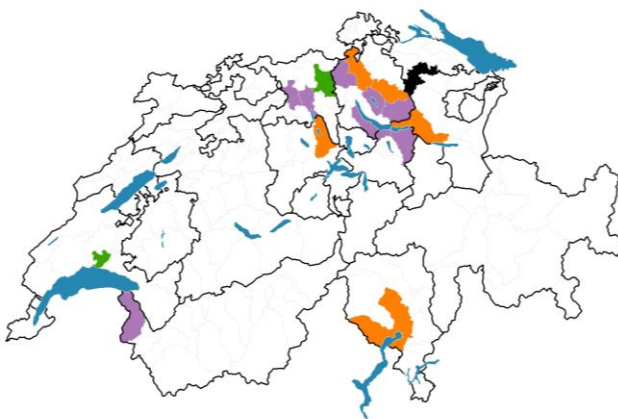
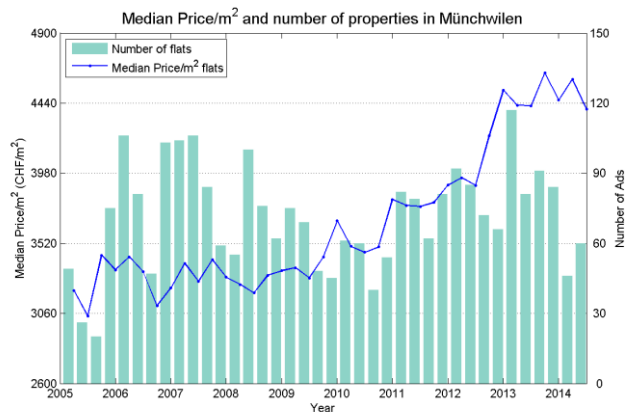
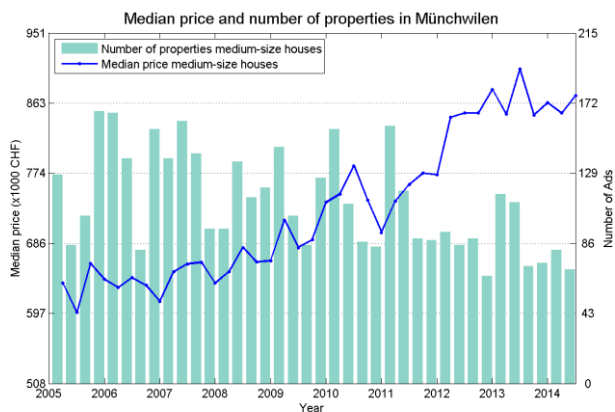


Figure C. 2: District: Münchwilen, Status: Regime Change, Property type: medium size houses (top left), all apartments (top right).

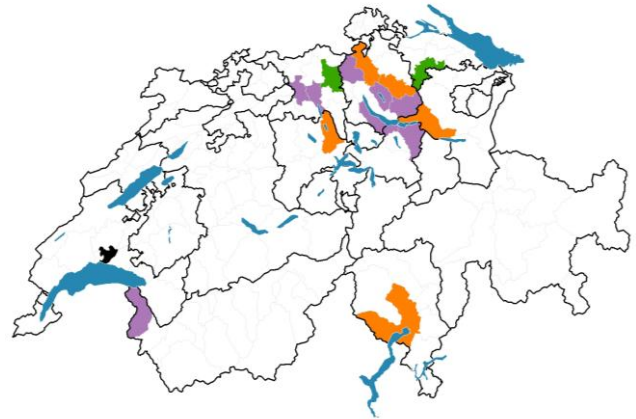
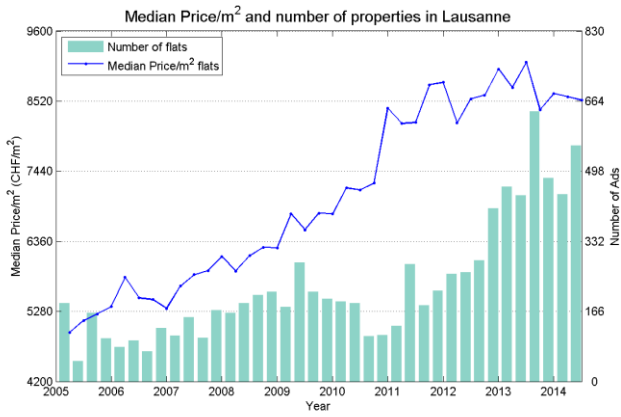


Figure C. 3: District: Lausanne, Status: Regime Change, Property type: all apartments.

Appendix E: Development of the Reported Districts in 2013-Q2, 2013-Q4 and 2014-Q2.

District Name	Analysis as of 2013-Q2				Analysis as of 2013-Q4				Analysis as of 2014-Q2			
	Status	Property Type	Property Size	Critical Time	Status	Property Type	Property Size	Critical Time	Status	Property Type	Property Size	Critical Time
Aarau	M	H/A	Medium/All	-	M	H/A	Medium /All	-	M	H/A	Medium/All	-
Affoltern	R	A	All	-	-	-	-	-	-	-	-	-
Baden	C	A	All	2013 Q3 - 2014 Q3	M	A	All	-	R	A	All	-
Bremgarten	R	A	All	-	-	-	-	-	-	-	-	-
Bülach	C	A	Medium/Small	2013 Q3 - 2014 Q4	C	A	All/Medium/Small	2014 Q1 - 2015 Q2	W	A	All/Medium/Small	-
Dielsdorf	C	A	All	2013 Q3 - 2014 Q3	W	A	All/Medium	-	M	A	All/Medium	-
Dietikon	R	A	Small	-	-	-	-	-	-	-	-	-
Hinwil	M	H/A	Medium/All	-	M	H/A	Medium/All	-	M	H/A	Medium/All	-
Hochdorf	-	-	-	-	W	A	Medium/Small	-	W	A	Medium/Small	-
Höfe	M	A	Medium	-	M	A	Medium	-	M	A	Medium	-
Horgen	M	A	All	-	M	A	All	-	M	A	All	-
Jura-Nord Vaudois	M	H	Medium	-	R	H	Medium	-	-	-	-	-
Lausanne	M	A	All	-	M	A	All	-	R	A	All	-
Lenzburg	M	H	Medium	-	M	H	Medium	-	M	H	Medium	-
Locarno	M	A	All	-	W	A	All/Small	-	W	A	All/Small	-
March	M	A	All	-	M	A	All	-	M	A	All	-
Monthey	M	A	All	-	M	A	All	-	M	A	All	-
Münchwilen	M	A/H	Medium	-	M	H/A	Medium /All	-	R	H/A	Medium /All	-
Pfäffikon	W	A	Medium	-	W	A	Medium	-	W	A	Medium	-
See-Gaster	-	-	-	-	W	A	All/Medium	-	W	A	All/Medium	-
Uster	W	A	Medium/Small	-	M	A	All	-	M	A	All	-
Zug	R	A	All	-	-	-	-	-	-	-	-	-

Status: C: Critical, W: To Watch, M: To Monitor, R: Regime Change

Property Type: A: Apartments, H: Houses