

## **Risk Analysis of the Real Estate Market in Switzerland (Diagnostic as of 2013-Q2)**

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### **Introduction**

This work is a collaboration between comparis.ch and the chair of Entrepreneurial Risks at the Department of Management, Technology and Economics (D-MTEC) of ETH Zurich and has been jointly funded by the Commission for Technology and Innovation (CTI) and 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 2013. 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 four 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 490'000 apartments and 560'000 houses for sale on the market between 2005-Q1 and 2013-Q2, which amount to a total of about 1'050'000 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	
Measure	Median Asking Price		Median Asking Price per Square Meter	
Size	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

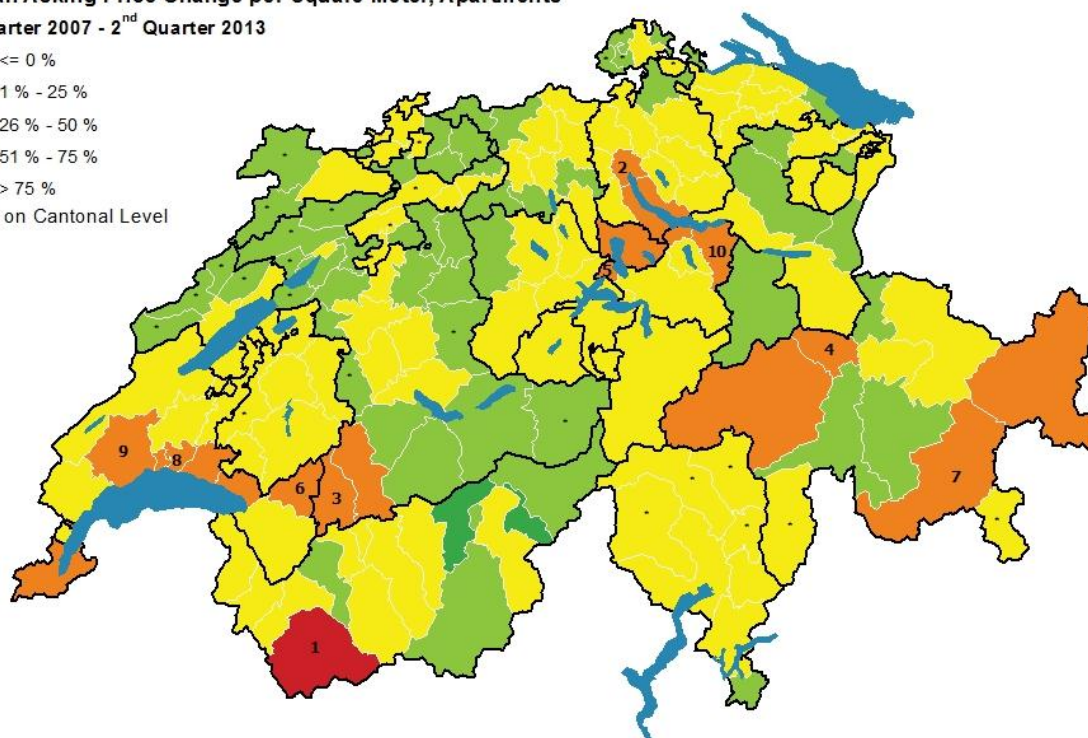
Figure 1 shows the change in median asking price per square meter between the first quarter of 2007 and the second quarter of 2013 for all apartments listed on comparis.ch during this period. The district of Entremont, marked in red, shows the highest price increase, where the median asking price of apartments per square meter has more than doubled since the first quarter of 2007 (130% increase).

**Median Asking Price Change per Square Meter, Apartments**

1<sup>st</sup> Quarter 2007 - 2<sup>nd</sup> Quarter 2013

- <= 0 %
- 1 % - 25 %
- 26 % - 50 %
- 51 % - 75 %
- > 75 %

\* Data on Cantonal Level



**Figure 1: Change in median asking price per square meter for apartments in all Swiss districts between 2007-Q1 and 2013-Q2.**

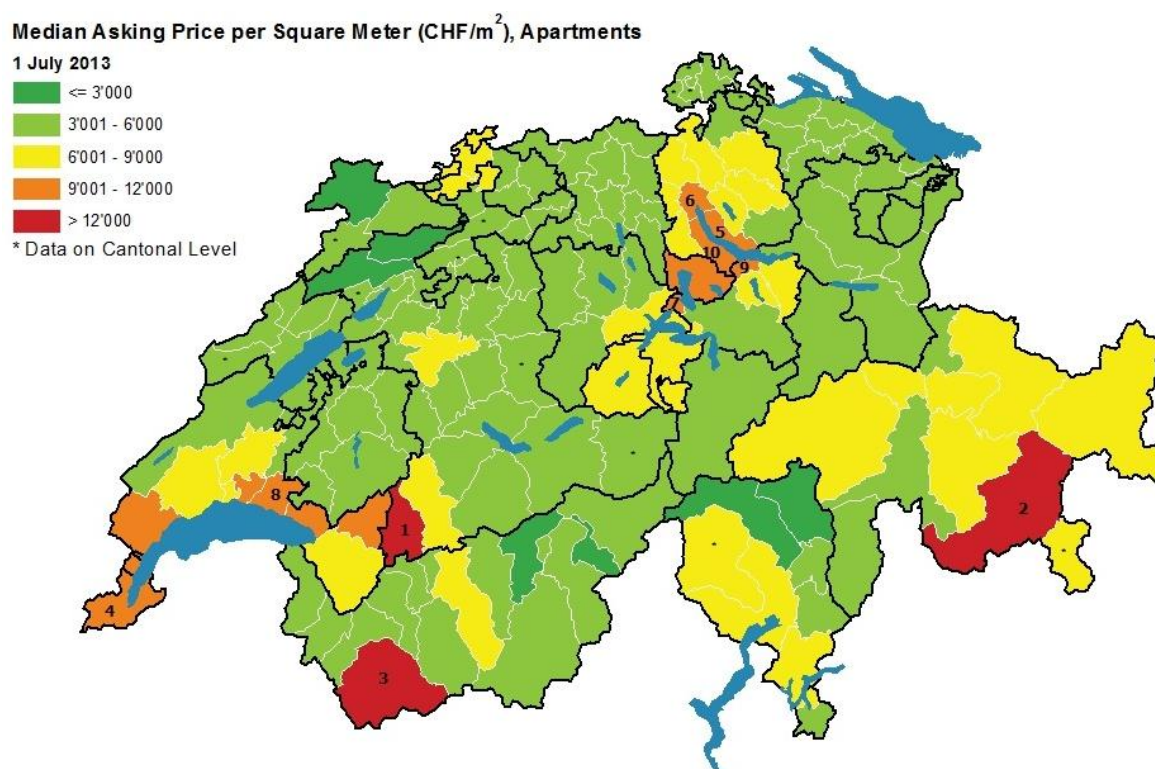
The regions marked with “\*” represent the districts with not enough listings in either the second quarter of 2013 or the first quarter of 2007. The cantonal median price change per square meter values are shown for those districts. The top ten districts with the highest increase in the

apartments' asking price per square meter between 2007-Q1 and 2013-Q2 are labeled in Figure 1 and listed in Table 2.

**Table 2: Top 10 districts with the highest increase in asking price per square meter since 2007-Q1.**

	District	Median increase in asking price per square meter
1	Entremont (VS)	130%
2	Zürich (ZH)	69%
3	Saanen (BE)	69%
4	Imboden (GR)	68%
5	Küssnacht (SZ)	65%
6	Riviera-Pays-d'Enhaut (VD)	63%
7	Maloja (GR)	62%
8	Lausanne (VD)	61%
9	Morges (VD)	60%
10	March (SZ)	58%

Figure 2 shows the median asking price per square meter for apartments as of 1 July 2013. Districts with "\*" marks represent the districts with not enough listings in the second quarter of 2013. The cantonal median prices per square meter for apartments are shown for these districts. The top ten currently most expensive apartments 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 1 July 2013.**

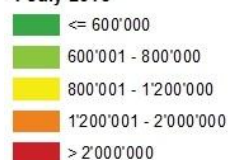
**Table 3: Top 10 districts with the highest asking price per square meter for apartments as of 1 July 2013.**

	District	Median asking price per square meter (CHF/m <sup>2</sup> )
1	Saanen (BE)	14'000
2	Maloja (GR)	14'000
3	Entremont (VS)	12'500
4	Geneva (GE)	12'000
5	Meilen (ZH)	11'500
6	Zürich (ZH)	11'000
7	Küssnacht (SZ)	10'500
8	Lavaux-Oron (VD)	10'000
9	Höfe (SZ)	10'000
10	Horgen (ZH)	9'500

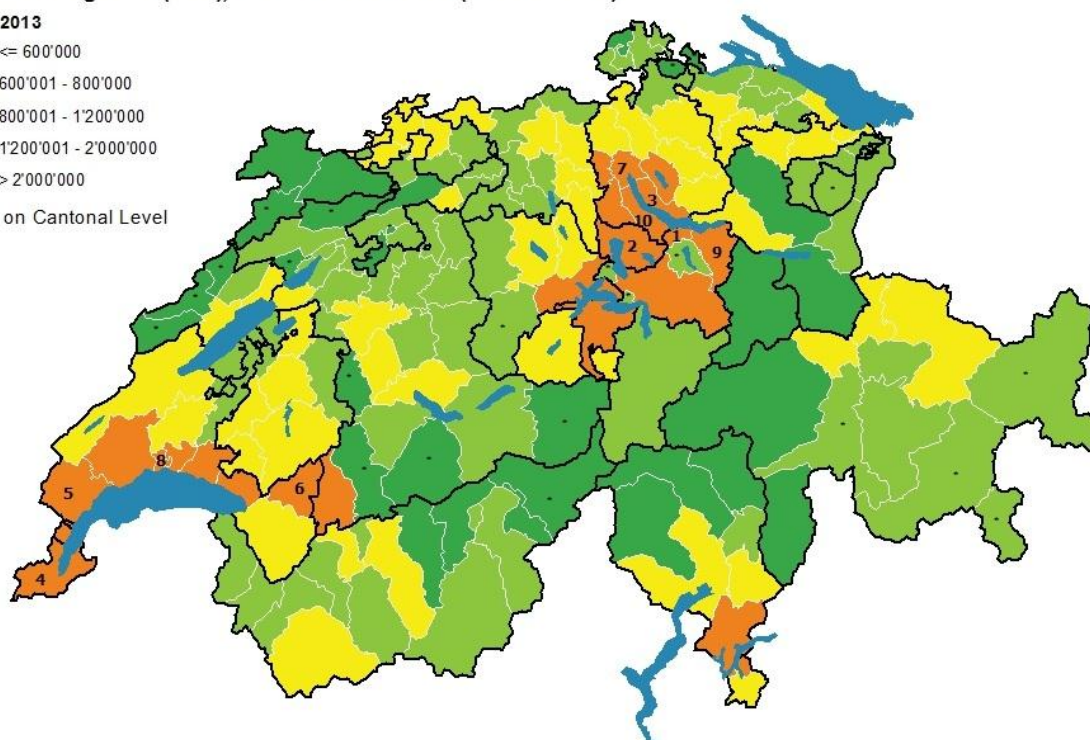
The median asking prices for medium size houses (5 to 6.5 rooms) as of 1 July 2013 are shown in Figure 3. Districts with "\*" marks represent the districts with not enough listings in the second quarter of 2013. The cantonal median asking prices for medium size houses are shown for these districts (As of 2013-Q2, the median asking prices of medium size houses in none of the districts are above 2'000'000 CHF. However, the color classification is kept for consistency with the images of previous quarters). The top ten currently most expensive medium size houses are labeled in Figure 4 and listed in Table 4.

**Median Asking Price (CHF), Medium Size Houses (5 - 6.5 Rooms)**

1 July 2013



\* Data on Cantonal Level



**Figure 3: Median asking price of medium size houses (5 to 6.5 rooms) in all Swiss districts as of 1 July 2013.**



**Table 4: Top 10 districts with the highest asking price for medium size houses as of 1 July 2013.**

	District	Median asking price (CHF)
1	Höfe (SZ)	2'000'000
2	Zug (ZG)	1'750'000
3	Meilen (ZH)	1'700'000
4	Geneva (GE)	1'700'000
5	Nyon (VD)	1'650'000
6	Riviera-Pays-d'Enhaut (VD)	1'600'000
7	Zürich (ZH)	1'550'000
8	Ouest lausannois (VD)	1'500'000
9	March (SZ)	1'500'000
10	Horgen (ZH)	1'500'000

The available data is not sufficient to generate price heat maps for the other categories of properties mentioned in Table 1.

## 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. 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](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 2013-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. Only for this status is the LPPL method able to bracket with confidence the expected time of the change of regime.

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

**Monitor:** This status is only obtained after a district has been previously depicted as a “Critical” or “Watch” district. The price could be increasing without anymore a bubble signal or decreasing but there are not 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 “Monitor” district and the latest data points confirm a change of regime.

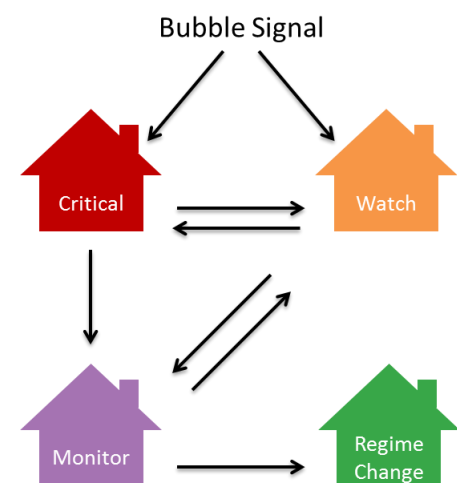
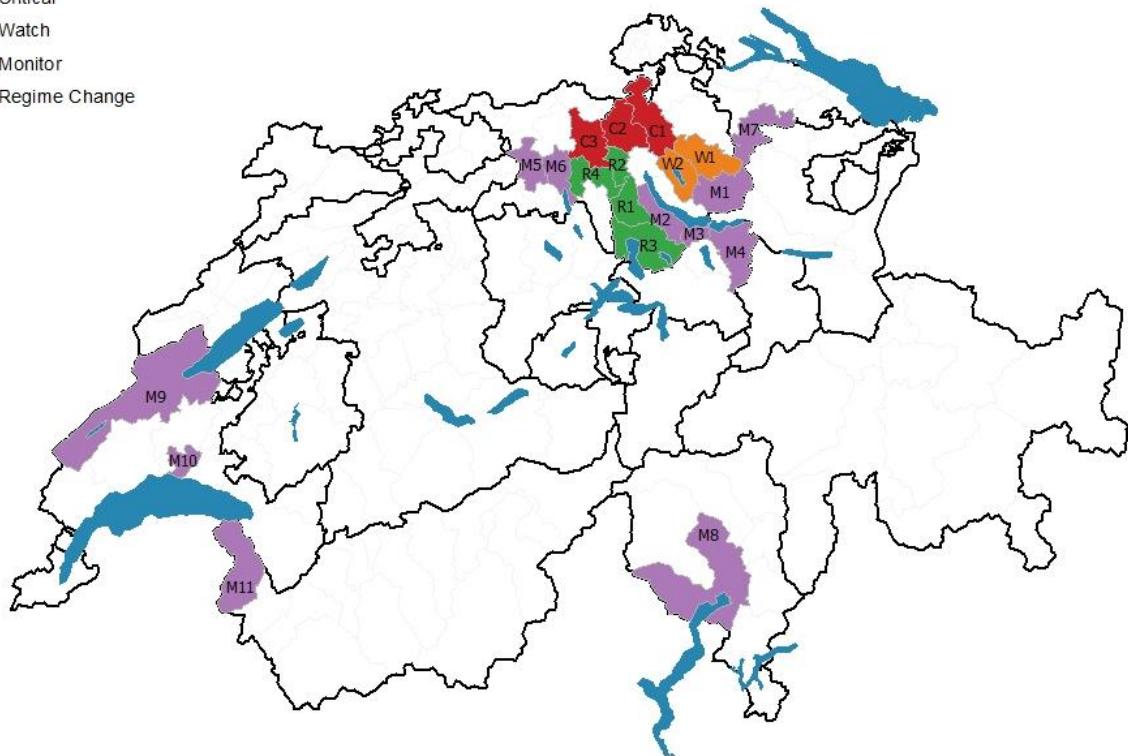


Figure 4: Classification of the districts.

- A “Critical” district can become a “Watch” or “Monitor” district depending on the presence/strength of new bubble signals and the price dynamics.
- A “Watch” district can become a “Critical” or “Monitor” district depending on the presence/strength of new bubble signals and the price dynamics.
- A “Monitor” district can become a “Watch” or a “Regime Change” district depending on the presence/strength of new bubble signals and the price dynamics.

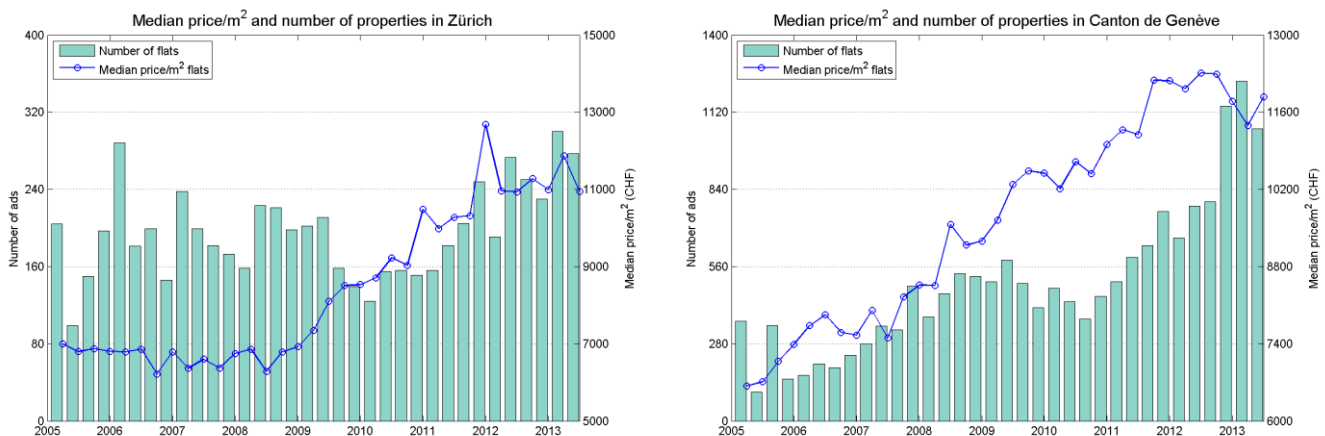


Label	District Name	Status	Property Type	Property Size	Critical Time
C1	Bülach	Critical	Apartments	Medium/Small	2013 Q3 - 2014 Q4
C2	Dielsdorf	Critical	Apartments	All	2013 Q3 - 2014 Q3
C3	Baden	Critical	Apartments	All	2013 Q3 - 2014 Q3
W1	Pfäffikon	Watch	Apartments	Medium	-
W2	Uster	Watch	Apartments	Medium/Small	-
M1	Hinwil	Monitor	Houses/Apartments	Medium/All	-
M2	Horgen	Monitor	Apartments	All	-
M3	Höfe	Monitor	Apartments	Medium	-
M4	March	Monitor	Apartments	All	-
M5	Aarau	Monitor	Houses/Apartments	Medium/All	-
M6	Lenzburg	Monitor	Houses	Medium	-
M7	Münchwilen	Monitor	Apartments/Houses	Medium	-
M8	Locarno	Monitor	Apartments	All	-
M9	Jura-Nord Vaudois	Monitor	Houses	Medium	-
M10	Lausanne	Monitor	Apartments	All	-
M11	Monthey	Monitor	Apartments	All	-
R1	Affoltern	Regime Change	Apartments	All	-
R2	Dietikon	Regime Change	Apartments	Small	-
R3	Zug	Regime Change	Apartments	All	-
R4	Bremgarten	Regime Change	Apartments	All	-

Figure 5: Result of the LPPL analysis as of 1 July 2013.

The results of the LPPL analysis on the real estate market in Switzerland using the comparis.ch data from 2005-Q1 till 2013-Q2 is summarized in Figure 5. The price dynamics of districts labeled C1 through C3 show very strong signs of speculative bubbles with critical times between 2013-Q3 and 2014-Q4. The districts labeled W1 and W2 should be watched and could become either critical or cool off and move to the monitor list. Districts M1 through M11 should be monitored and depending on the data from 2013-Q3 and 2013-Q4 could move to the watch list or confirm a change of regime. Districts R1 through R4 clearly show a change of regime which agrees with our previous forecast in January 2013. Detailed results of these analyses are presented in Appendices A through D, where the development in the asking prices along with possible LPPL scenarios are shown. It should be noted that the LPPL scenarios in the appendices A through D, are indicators of possible critical times (80 percent confidence intervals, shown as gray regions) in the corresponding districts and are not intended as future price indicators.

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. Our assessment has found no bubble signatures in these regions despite the fact that these districts have gone through a significant price increase and tend to be consistently reported as risky regions by other studies. The LPPL model requires a faster than exponential price growth, prioritizing the price-dynamics rather than the absolute price value to diagnose a price development as a bubble (comparing a district to itself at previous times instead of comparing it to all its peers). The condition of a faster than exponential price growth is essential in our methodology, and is not fulfilled in the canton of Geneva or the city of Zürich. Therefore, the development of prices in these districts does not satisfy our definition of a bubble.



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

## Conclusion and Recommendations

The Swiss Banks are implementing more conservative lending standards. The Swiss Financial Market Supervisory Authority (FINMA) approved a new set of minimum requirements for



mortgage financing. The new regime, which came into effect on July 2012, for the first time requires a minimum 10 percent down payment from the own borrower's funds without using the 2nd pillar of their retirement fund when purchasing a property and demands mortgages to be paid down to two thirds of the lending value within 20 years. This new scheme should prevent households from taking greater risks, as they will be unable to overuse the money from their pension funds to make the down payment and will be pressed to reduce the burden of the debt. In addition, the Swiss National Bank has also aimed for reducing the exposure of banks to real estate. As of 30 September 2013, the Swiss banks must hold a countercyclical capital buffer amounting to one percent of their risk-weighted positions associated with the mortgage loans financing residential property located in Switzerland.

The current economic and political situation of Switzerland do not suggest a sever crash in the critical regions and a soft landing or stagnation of prices is a more probable scenario. A confirmation of this can be seen in the price dynamics of the "Regime Change" districts, a soft landing of prices instead of a sharp correction has been observed in districts that had previously shown signs of bubbles. We expect the same behavior to repeat in the districts currently labeled as critical. It should be noted that the results of this study are based on a model for speculative bubbles and does not take into account exogenous shocks such as a possible escalation of the European debt crisis, which could affect the Swiss economy and real estate market as well.

Advise for buyers:

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. Households who can afford to wait may choose to postpone the purchase of their home in "Critical", "Watch" and "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.

## Appendix A: Review of 2013-Q2 Critical Districts.

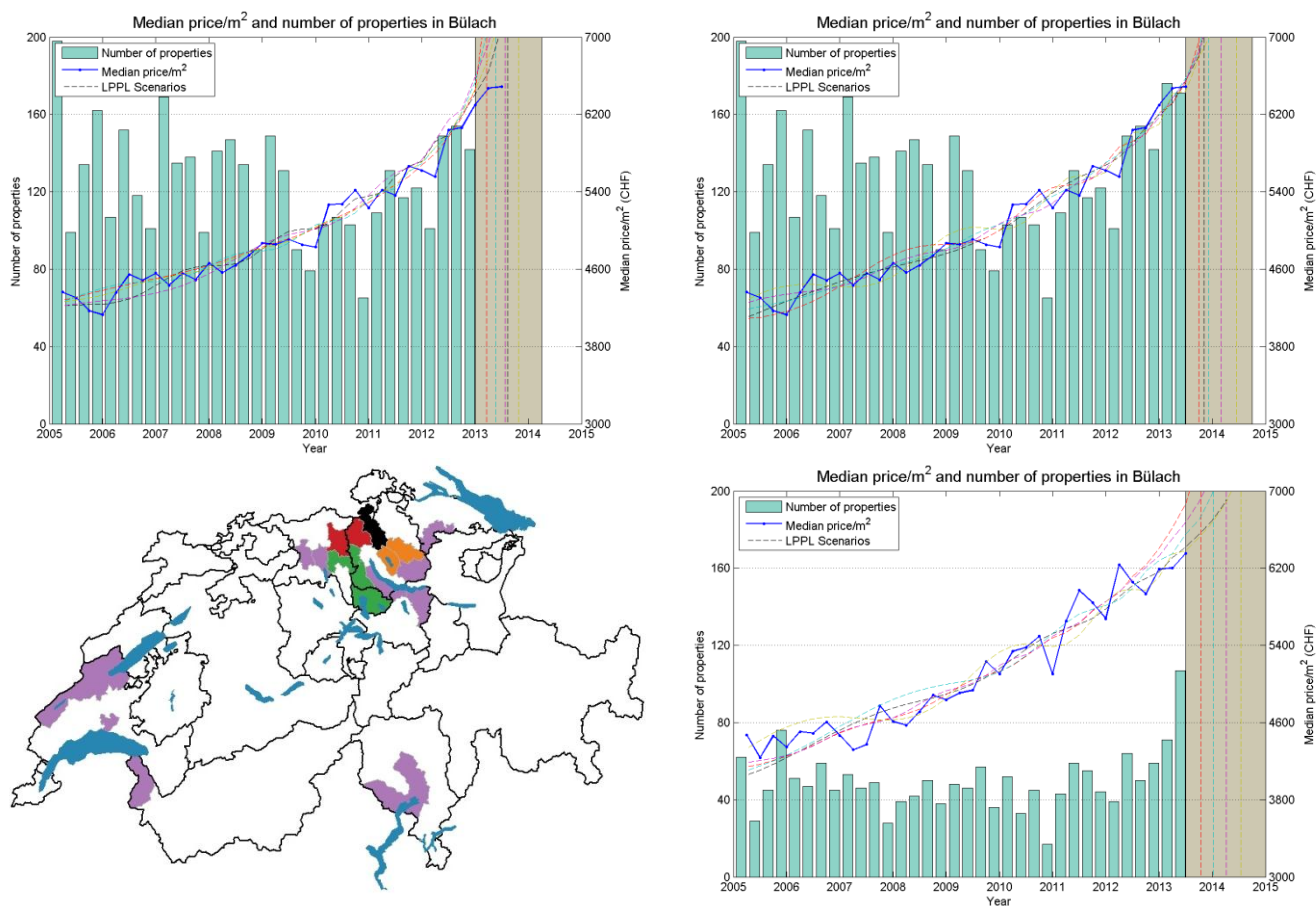


Figure A.1: Bülach. Left, 2012-Q4 forecast: Critical - all apartments.  
Right, 2013-Q2 forecast: critical - medium size apartments (top) and small apartments (bottom).

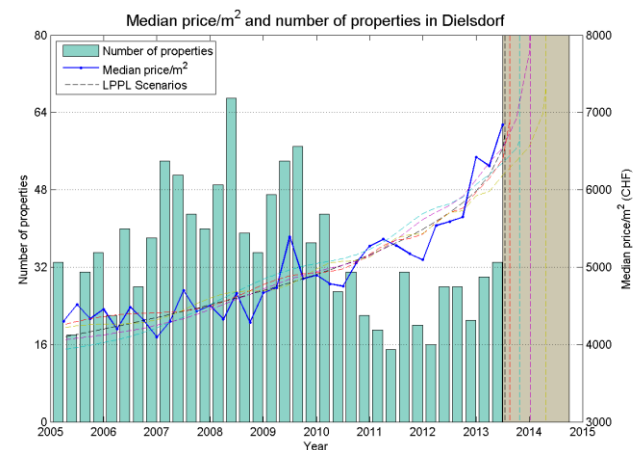
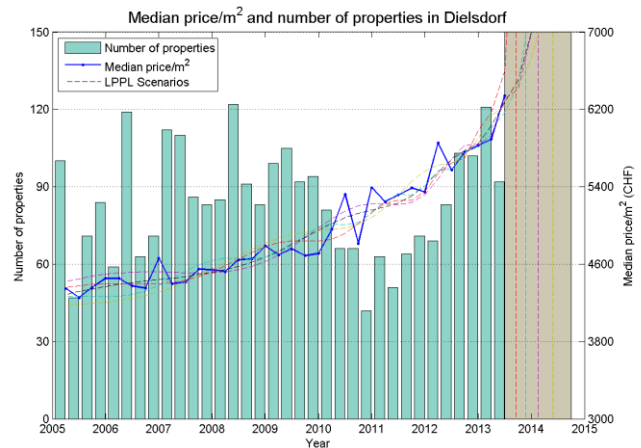
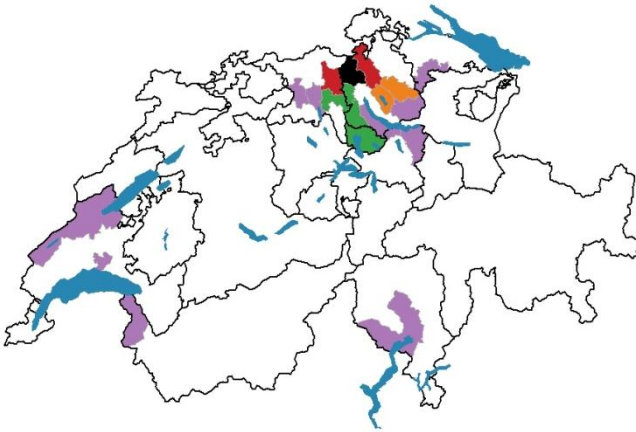
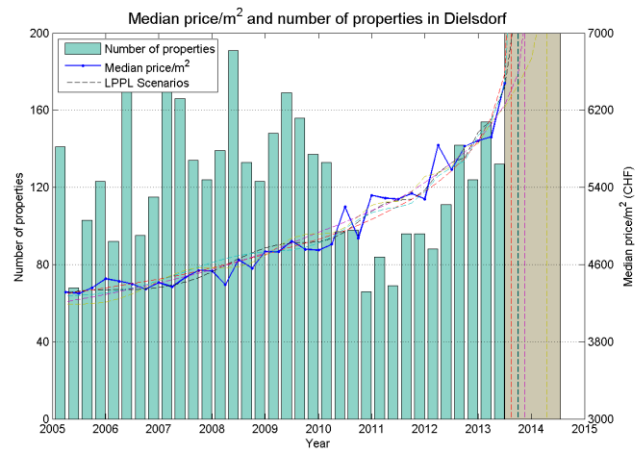
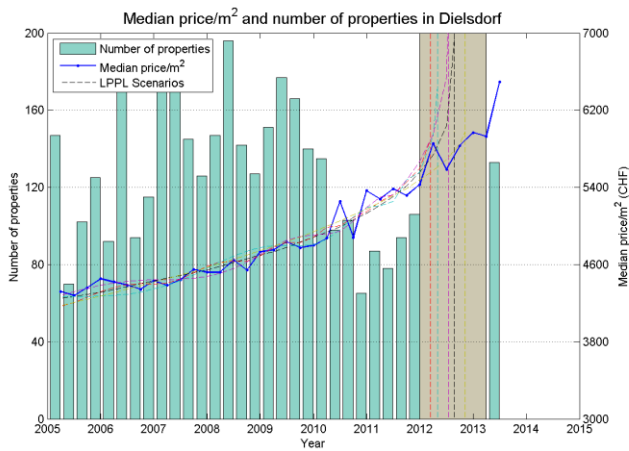


Figure A.2: Dielsdorf. Left, 2012-Q4 forecast: Watch - all apartments.  
Right, 2013-Q2 forecast: Critical - all apartments (top), medium size apartments (middle) and small size apartments (bottom).

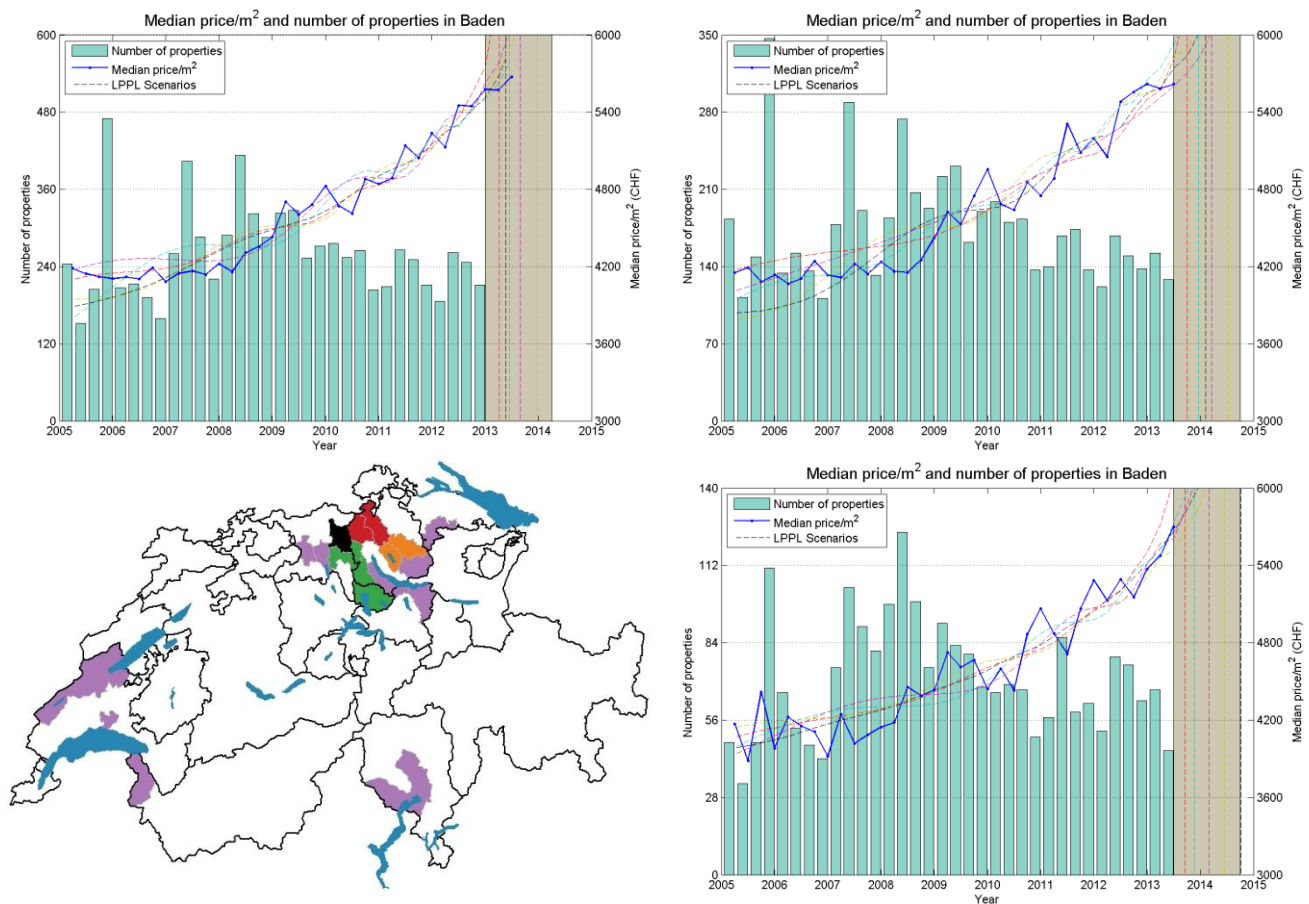


Figure A.3: Baden. Left, 2012-Q4 forecast: Critical - all apartments.  
Right, 2013-Q2 forecast: Critical – medium size apartments (top) and small apartments (bottom).

## Appendix B: Review of 2013-Q2 Watch Districts.

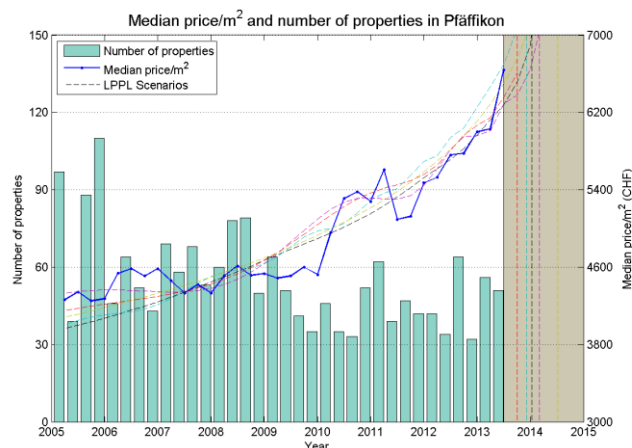
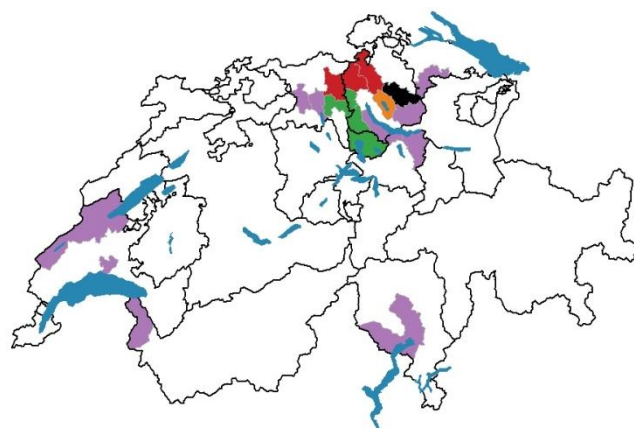


Figure B.1: Pfäffikon. 2013-Q2 forecast: Watch - medium size apartments.

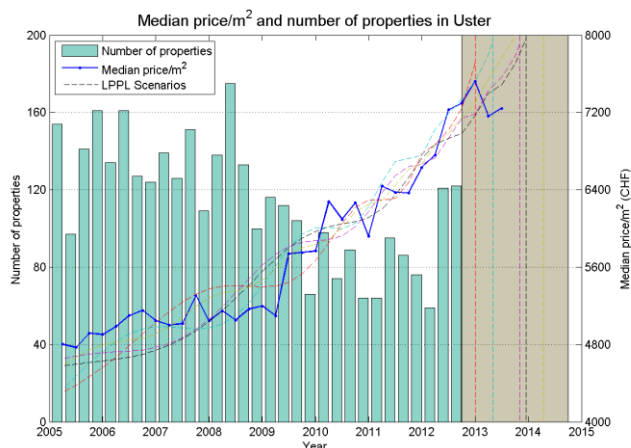
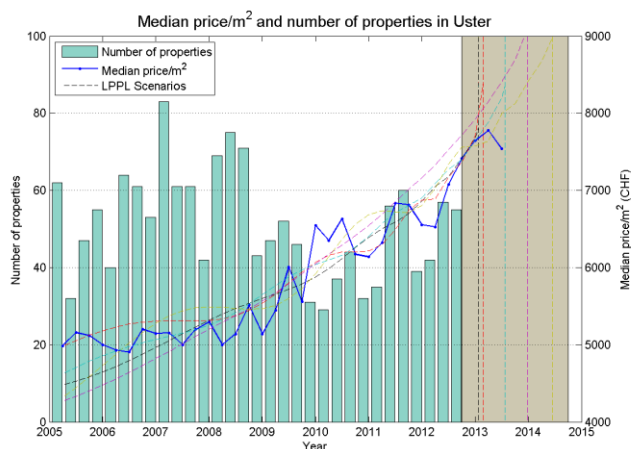
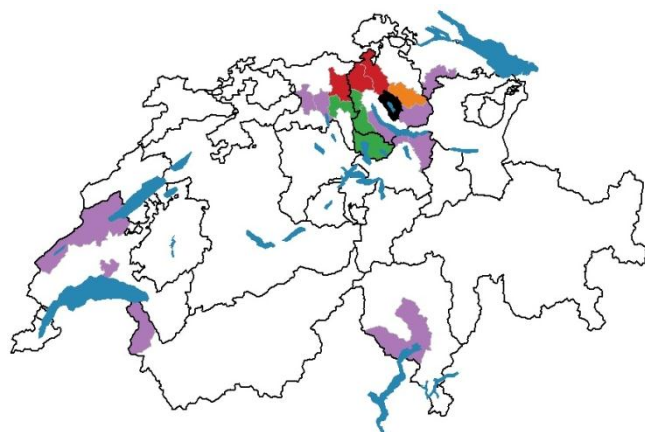


Figure B.2: Uster. 2013-Q2 forecast: Watch - medium size apartments (top) and small apartments (bottom).



## Appendix C: Review of 2013-Q2 Monitor Districts.

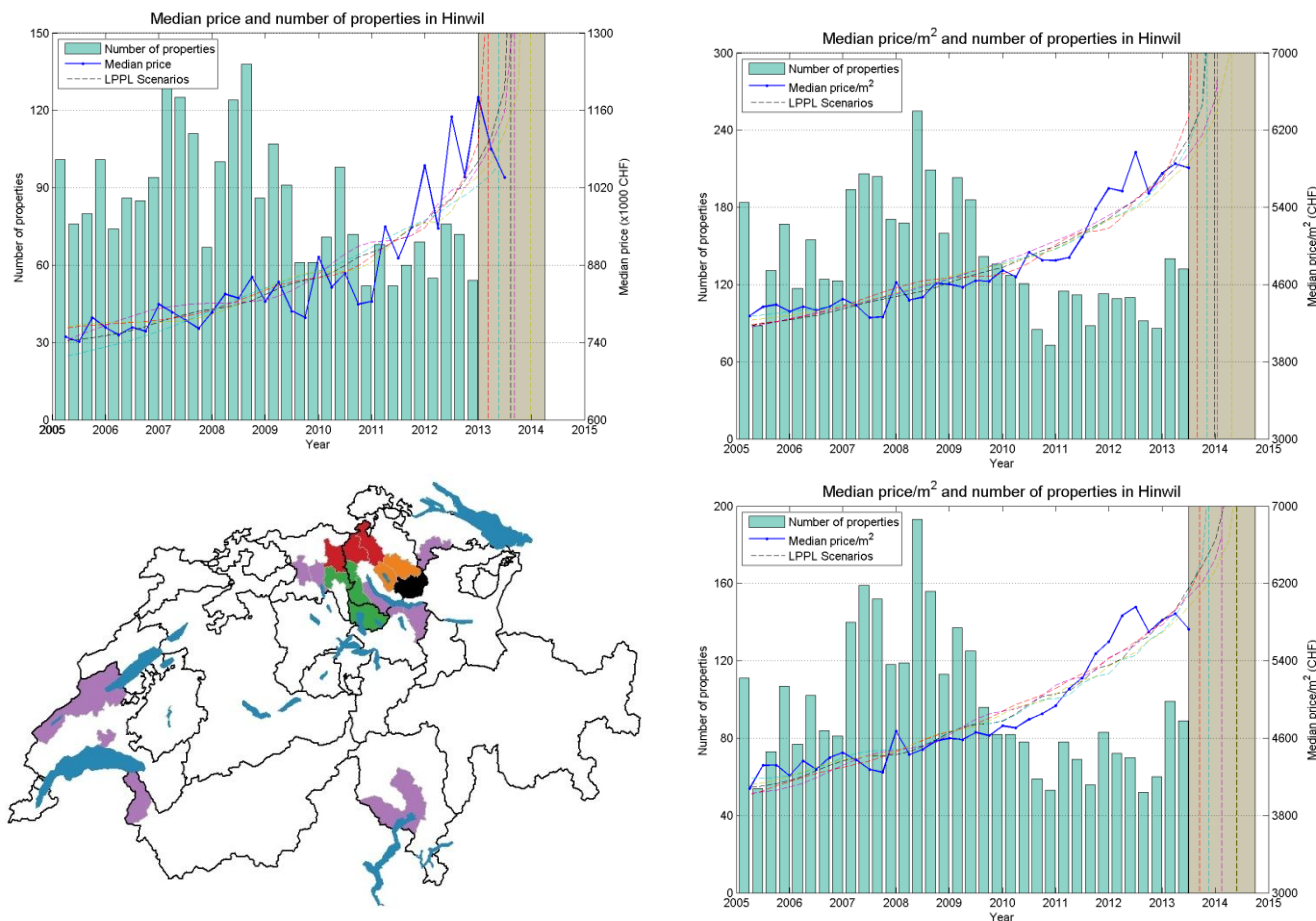


Figure C.1: Hinwil. Left, 2012-Q4 forecast: Critical - medium size houses. Right, 2013-Q2 forecast: Monitor - all apartments (top) and medium size apartments (bottom).

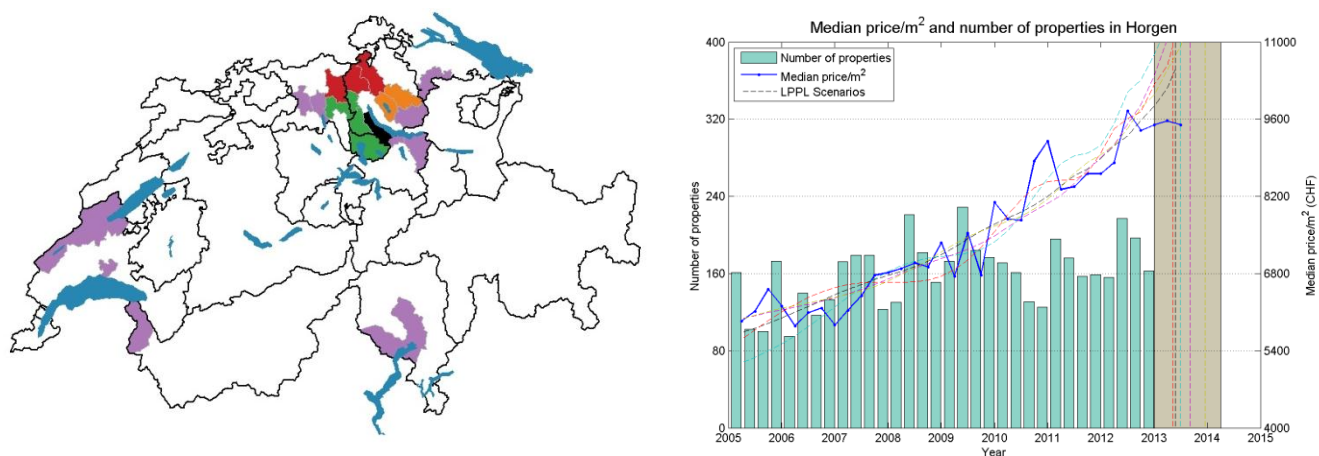
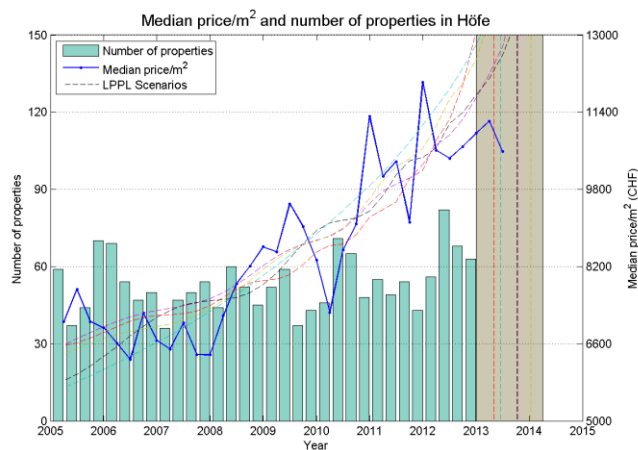
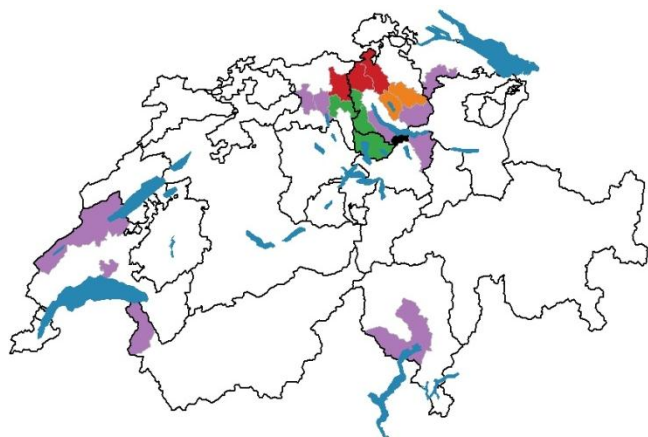
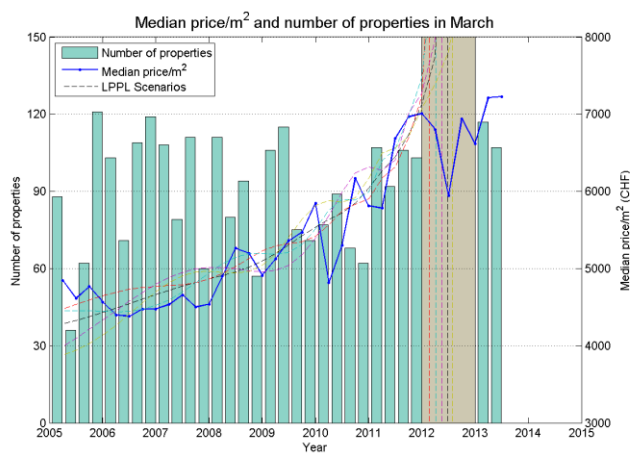
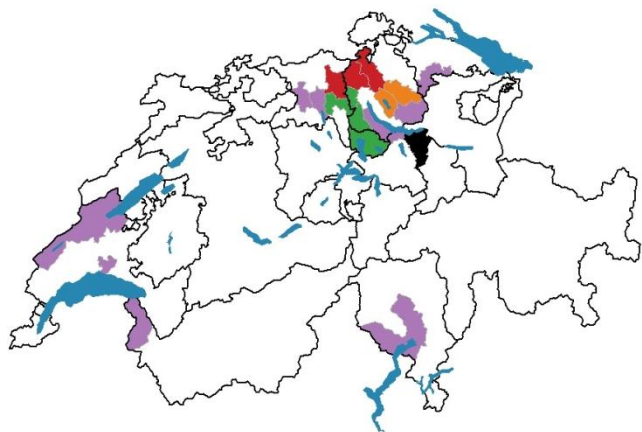


Figure C.2: Horgen. 2012-Q4 forecast: Critical - all apartments. 2013-Q2 forecast: Monitor.



**Figure C.3: Höfe. 2012-Q4 forecast: Critical - medium size apartments. 2013-Q2 forecast: Monitor.**



**Figure C.4: March. 2012-Q4 forecast: Watch - all apartments. 2013-Q2 forecast: Monitor.**

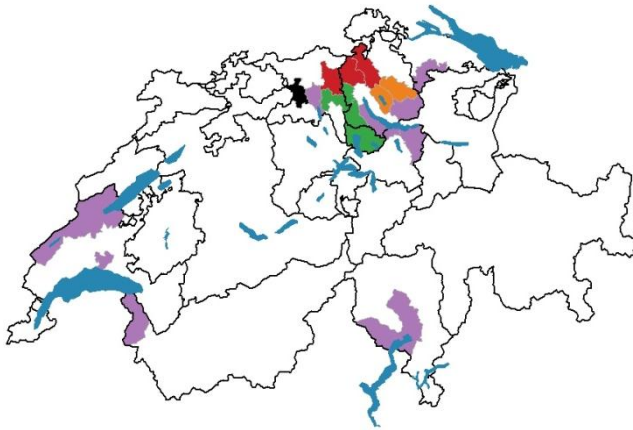
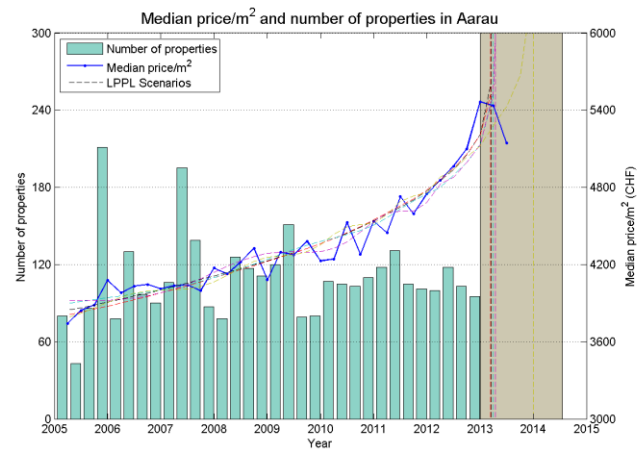
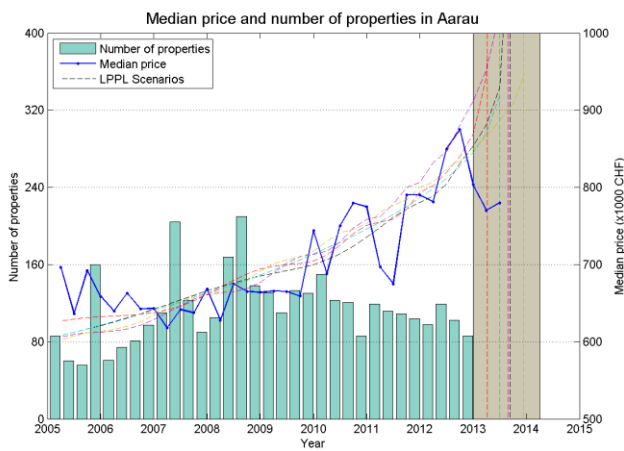


Figure C.5: Aarau. Left, 2012-Q4 forecast: Critical - medium size houses.  
Right, 2013-Q2 forecast: Monitor - all apartments.

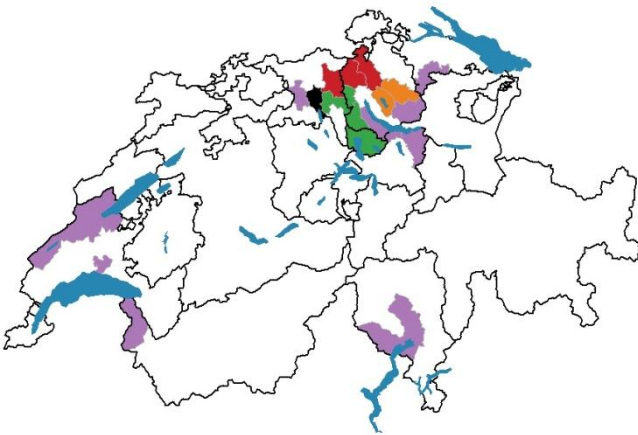
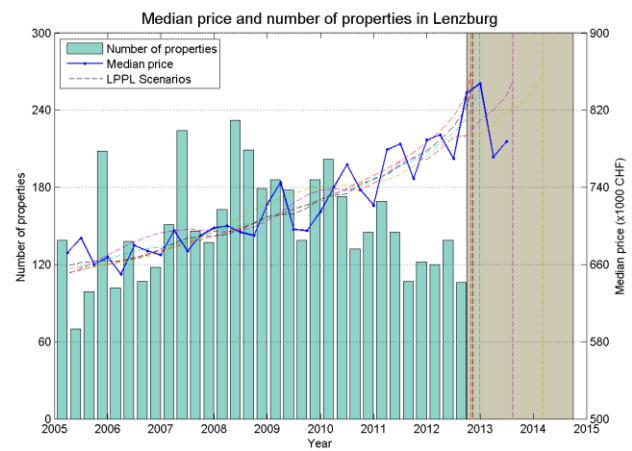
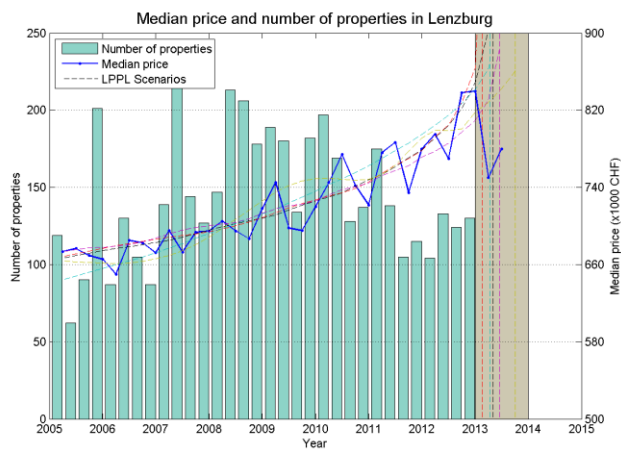


Figure C.6: Lenzburg. Left, 2012-Q4 forecast: Critical - medium size houses.  
Right, 2013-Q2 forecast: Monitor - medium size houses.

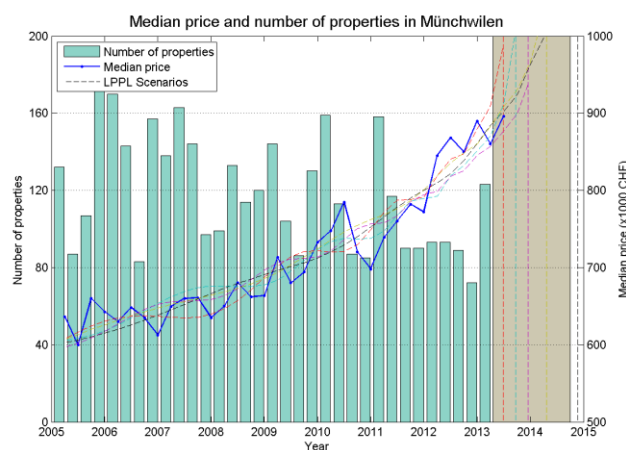
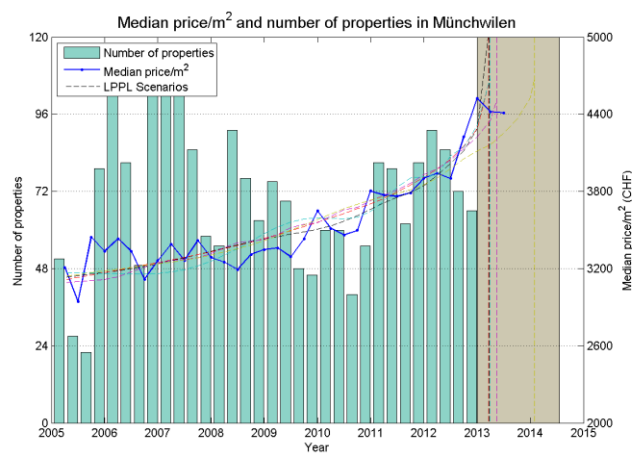
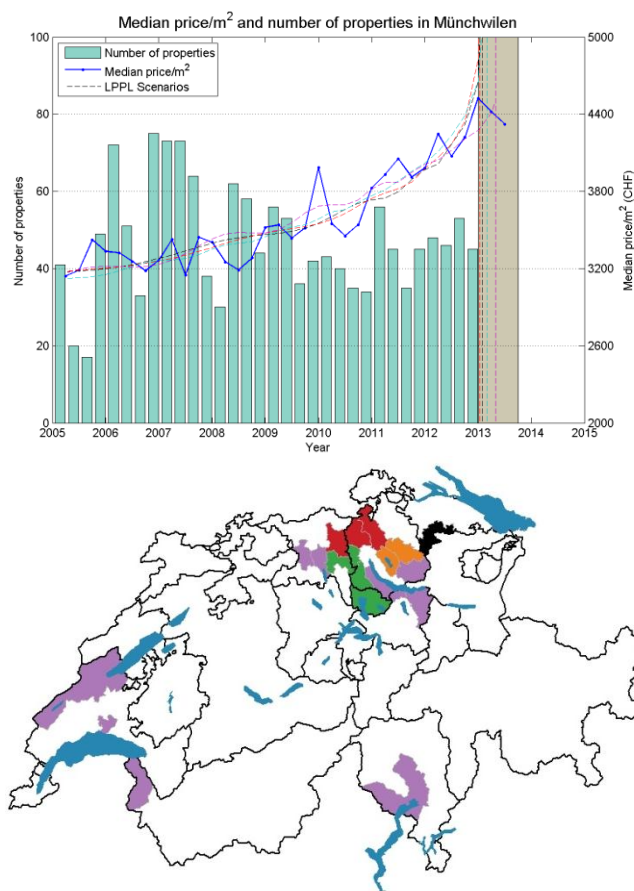


Figure C.7: Münchwilen. Left, 2012-Q4 forecast: Critical - medium size apartments. Right, 2013-Q2 forecast: Monitor – all apartments (top) and medium size houses (bottom).



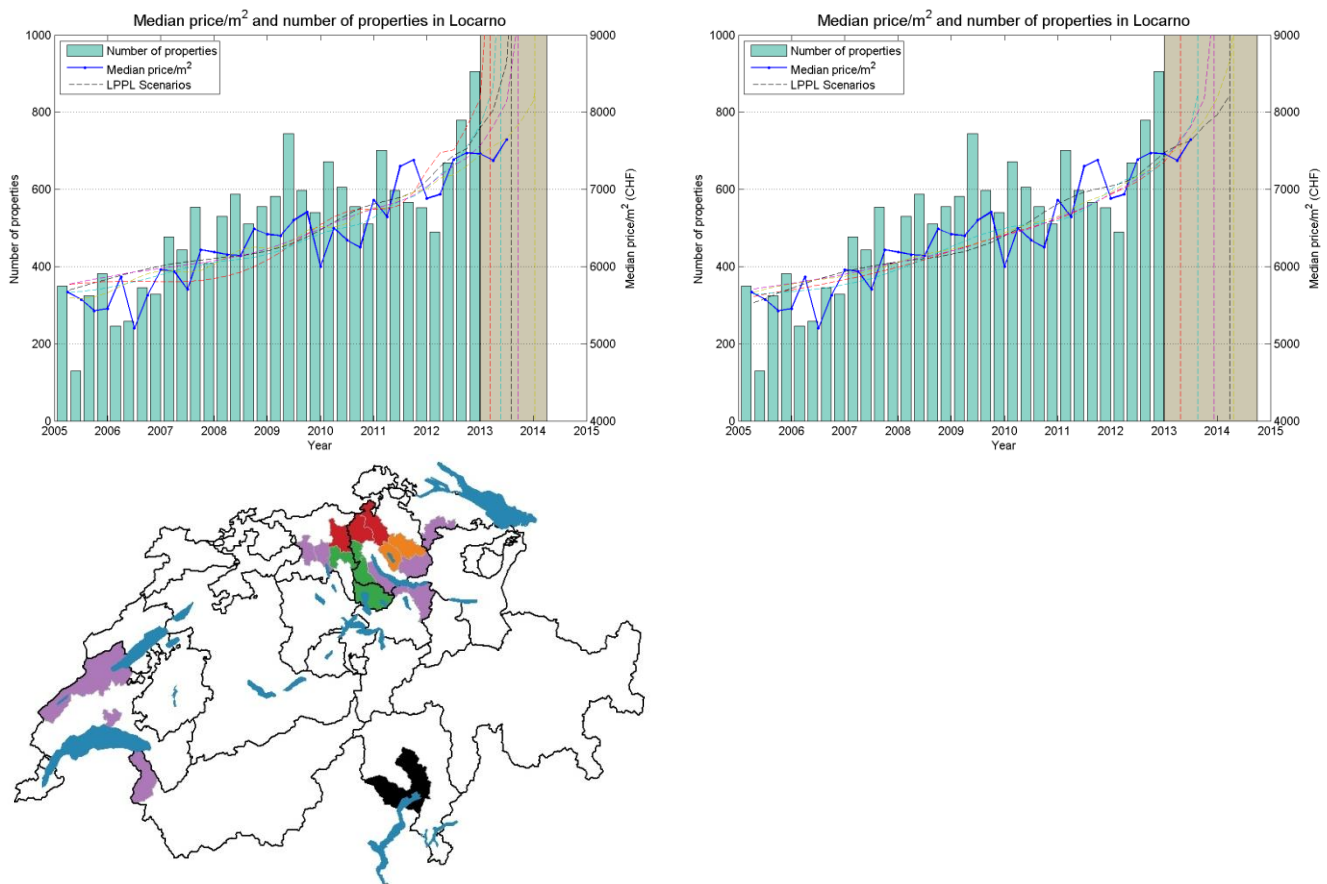


Figure C.8: Locarno. Left, 2012-Q4 forecast: Critical - all apartments.  
Right, 2013-Q2 forecast: Monitor - all apartments.

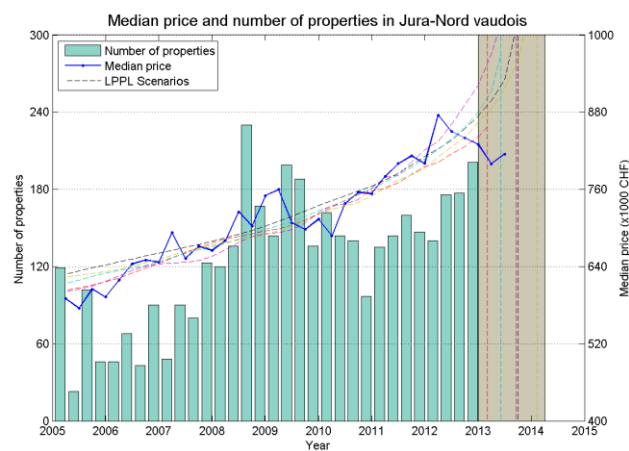
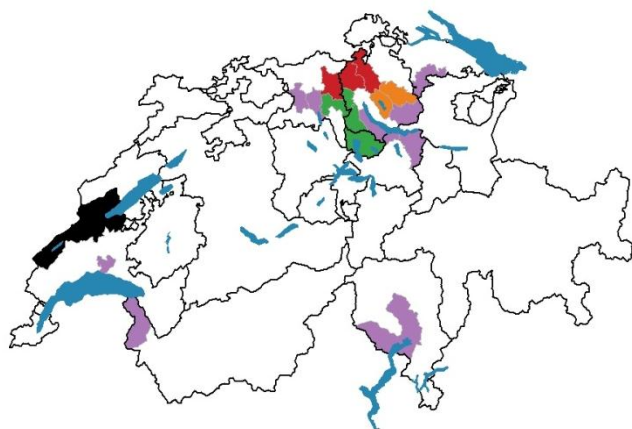


Figure C.9: Jura-Nord Vaudois. 2012-Q4 forecast: Critical - medium size houses. 2013-Q2 forecast: Monitor.

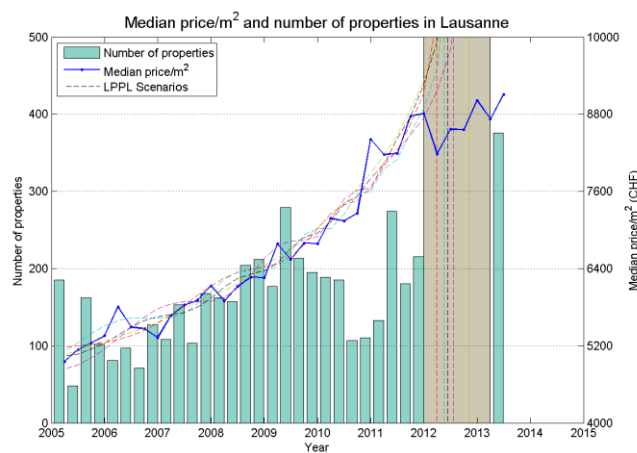
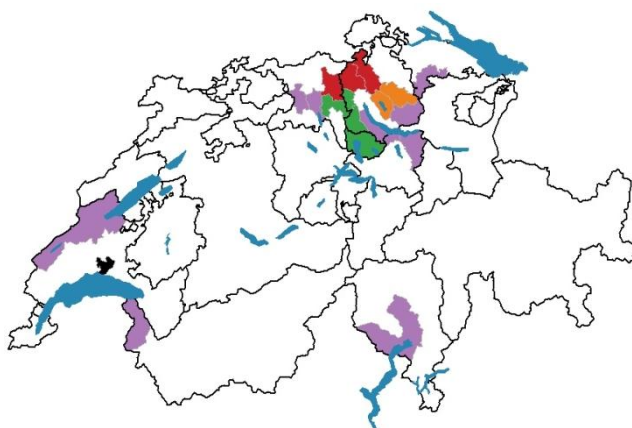


Figure C.10: Lausanne. 2012-Q4 forecast: Watch - all apartments. 2013-Q2 forecast: Monitor.

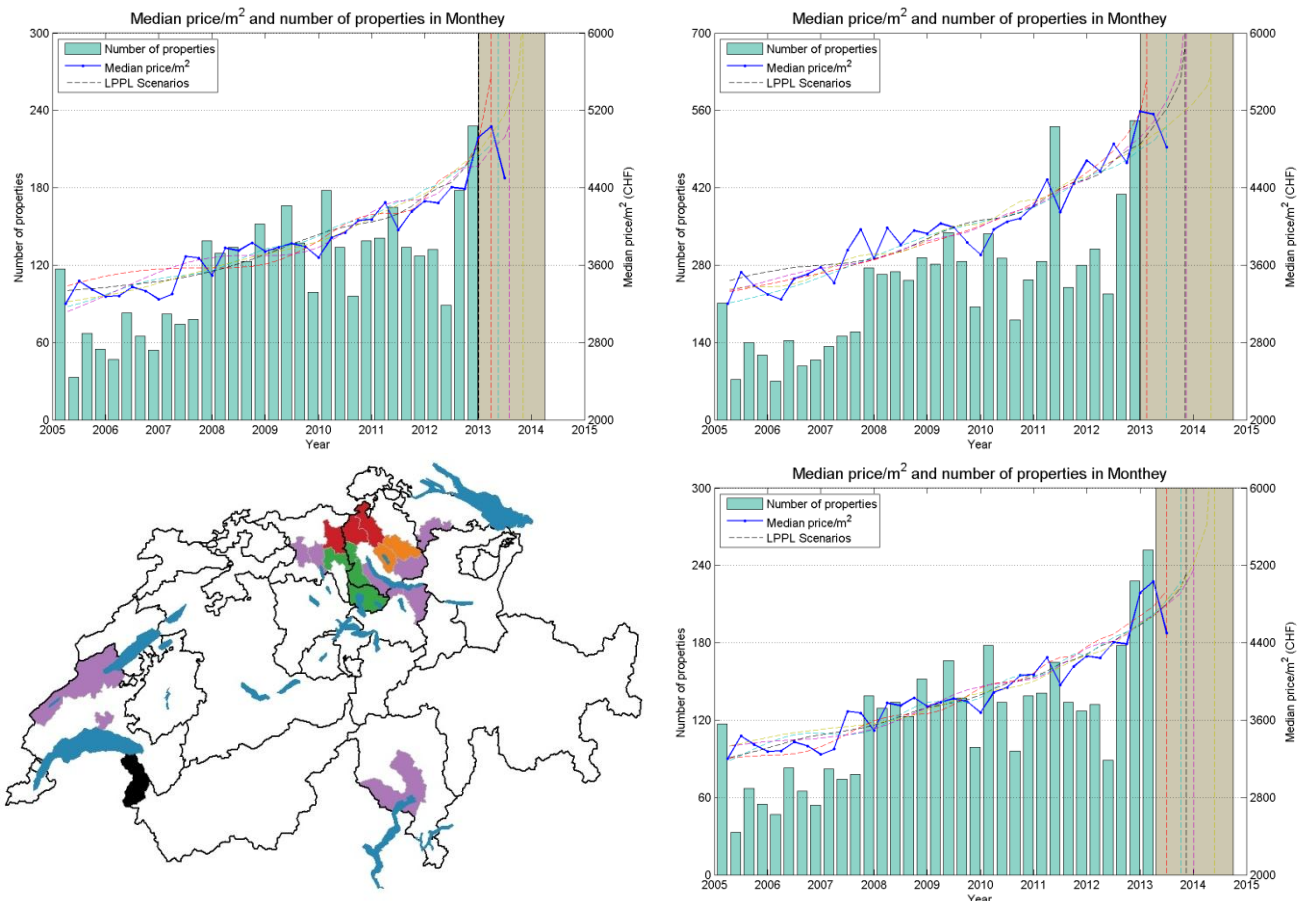


Figure C.11: Monthey. Left, 2012-Q4 forecast: Critical - medium size apartments. Right, 2013-Q2 forecast: Monitor - all apartments (top) and medium size apartments (bottom).

## Appendix D: Review of 2013-Q2 Regime Change Districts.

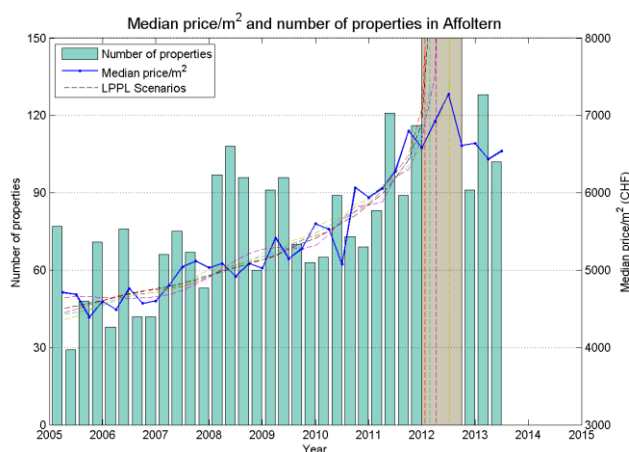
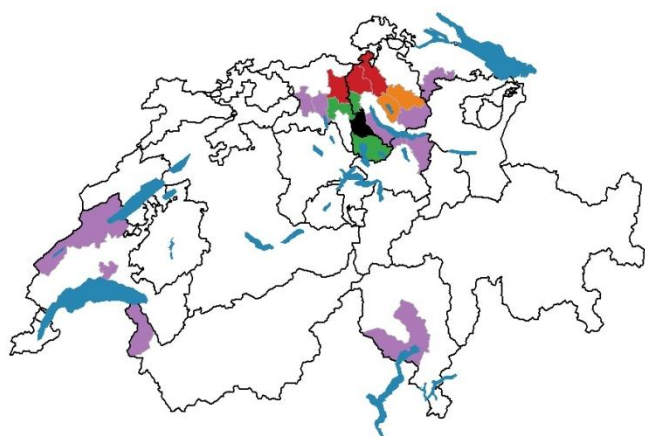


Figure D.1: Affoltern. 2012-Q4 forecast: Watch - all apartments. 2013-Q2 forecast: Regime Change.

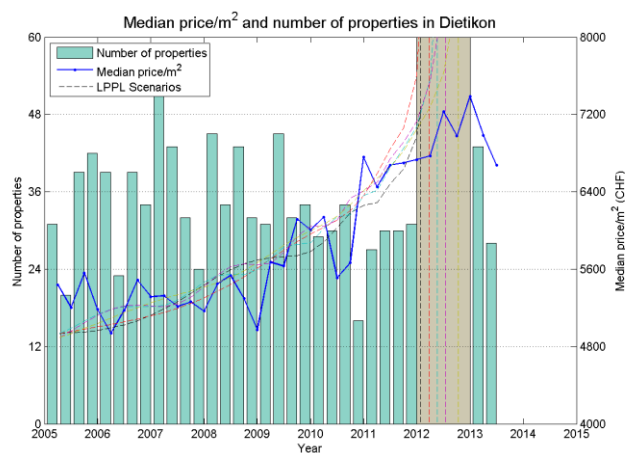
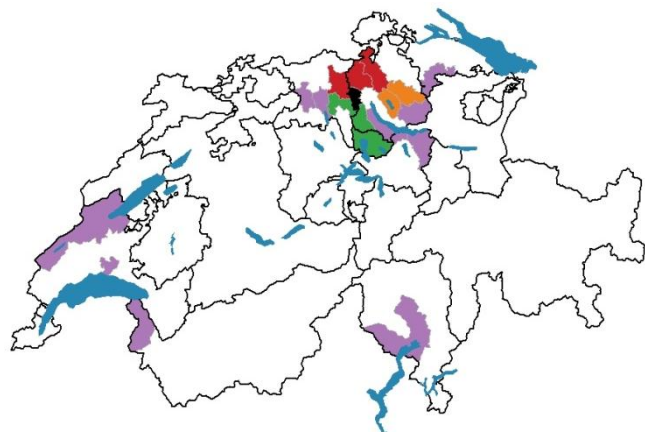


Figure D.2: Dietikon. 2012-Q4 forecast: Watch - small apartments. 2013-Q2 forecast: Regime Change.

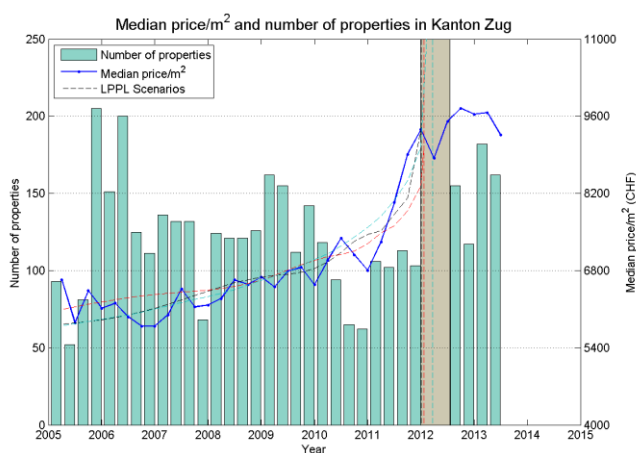
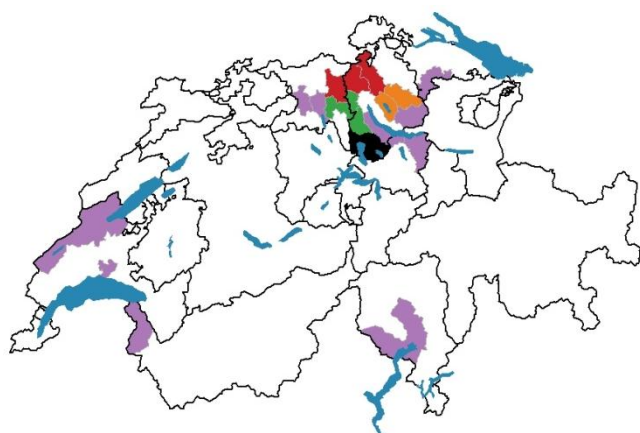


Figure D.3: Canton Zug. 2012-Q4 forecast: Watch - all apartments. 2013-Q2 forecast: Regime Change.

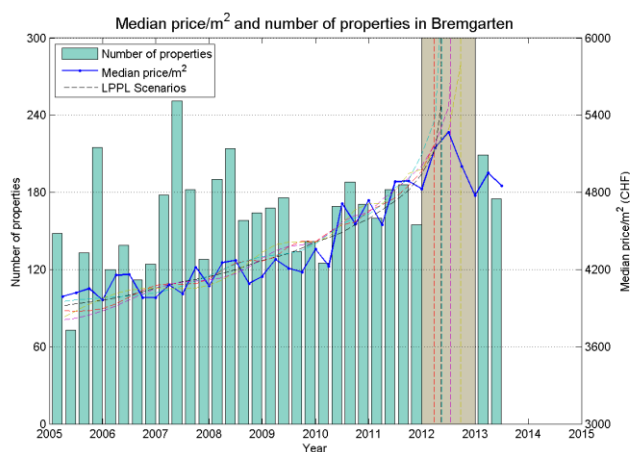
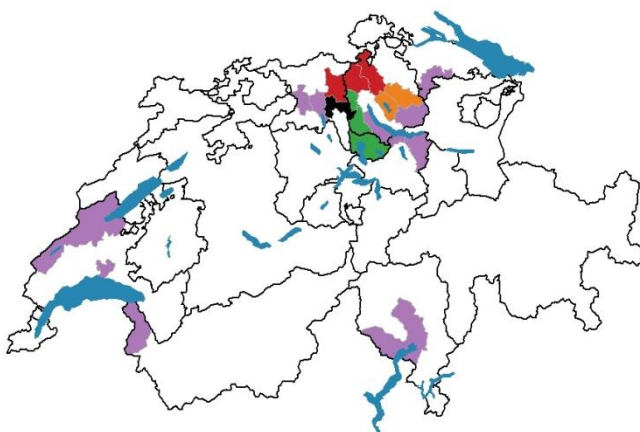


Figure D.4: Bremgarten. 2012-Q4 forecast: Watch - all apartments. 2013-Q2 forecast: Regime Change.