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Private money and money market integration: the role of payments infrastructure in 19th century Switzerland

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PRIVATE MONEY AND MONEY MARKET INTEGRATION: THE ROLE OF PAYMENTS INFRASTRUCTURE IN 19TH CENTURY SWITZERLAND

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Abstract

Using newly collected discount rate data for six Swiss cities, we find no evidence of increasing integration during a 30-year period of lightly regulated free banking. We attribute this to two structural issues: banks had incentives to protect their local monopolies, and the inherent instability of free banking meant that there was always a risk (which varied across banks) of a bank run. We use a novel counterfactual to show that these risks increased discount rate dispersion, and argue that as a result, public regulation of payments infrastructure was necessary for money market integration.

Keywords: Switzerland, discount rates, money market, financial integration, monetary union, 19th century
JEL Number: E43, E44, F33, F45, N13, N23

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1. Introduction

Selgin and White (1987) argue that free banking will eventually lead to the universal acceptance of banknotes and therefore an integrated money market. We consider the case of Switzerland in the second half of the 19th century where the establishment of the modern Swiss Confederation in 1848 was followed by the introduction of Swiss Franc coins, but there was no central bank and minimal regulation of note-issuance. This period of "unfettered" free banking lasted about 30 years following the introduction of the Swiss Franc until note issuance was uniformly regulated in 1881 with the passing of the Banknote Act. This makes Switzerland a perfect environment to study whether an integrated money market can develop in the presence of private money without central state intervention.

We use newly collected daily discount rate data for six Swiss cities to measure the integration of the Swiss money market. The data are collected from banks' annual reports, newspapers and exchange sheets and cover the period 1846-1893. We use the dispersion in these data to measure market integration: when discount rates are more similar, we consider the market to be more integrated. Free banking led to a segmented money market, characterised by discount rate dispersion. In particular, we find that there is no improvement in integration in the period of unfettered free banking after the new Swiss Franc became the dominant denomination of banknotes.

We attribute this finding to two structural issues which the private sector was not well-placed to address. First, although competition was strong in the sense that transport and transaction costs were low and declining during this period, it was weak in the sense that banks formed cartels to protect their local monopolies. Banks that branched across regions were fought by local incumbents. Local incumbents formed cartels to exclude new competitors and effectively limited banknote competition. The formation of cartels was also motivated by a desire to avoid public regulation. Second, unfettered free banking brought with it a conversion risk: the risk that in the event of a panic, a bank would have to convert large amounts of notes into metallic coin, exhausting its reserves. This risk varied across banks and could be mitigated by increasing the discount rate and thus reducing the ratio of notes in circulation to reserves, leading to discount rate dispersion.

We find that market segmentation declined markedly following the introduction of the Banknote Act in 1881. That Act was designed to address deficiencies in the payments infrastructure laid bare by the financial crisis that followed the outbreak of the Franco-Prussian war in 1870. It required banknotes to be accepted at par and regulated note issuing banks, ending the period of unfettered free banking. In addition, it established common reporting standards, as well as liquidity and capital provisions. We argue that this Act forced an end to local monopolies and cartels in note issuance, which had otherwise been successfully defended by incumbents and, by reducing the incentive to run on a bank, homogenised conversion risk and reduced discount rate dispersion. It was these factors, rather than traditional explanations such as reductions in transportation and transaction costs, which led to the integration of money markets in Switzerland.

To quantify the effect of these two factors, we use a novel counterfactual. Norway was similar economically and in its monetary regime to Switzerland but, since the Norges Bank held the monopoly on note issuance, there was no incentive to protect local monopolies and conversion risk was negligible. We show that, on average, discount rate dispersion in Switzerland was materially higher than in Norway in the period of unfettered free banking but was identical in the period after the Banknote Act.

Overall, we find little evidence that, left to its own devices, the private sector would have generated an integrated money market. This is an important finding given the recent rise of new forms of private money in the shape of stable coins which, similar to banknotes in free banking, are frequently pegged to a relatively stable unit of account. Alongside the recent experience with stubbornly low inflation in the post-Global Financial Crisis period followed by unusually high inflation in the aftermath of the coronavirus pandemic and the Russian invasion of Ukraine, this has led some to look back on free banking as an example of private money providing an alternative to the current monetary system (Schuler (2023)). Others have used free banking examples to argue in favour of regulation for these new forms of private money (Gorton and Zhang (2023)) and the benefits of public over private money (Bordo (2017)). In addition, recent theoretical work has shown that purely privately issued fiat currency may fail to implement an efficient allocation of resources (Fernández-Villaverde and Sanches (2019)). We add to this discussion by arguing that, in the case of Switzerland at least,

public intervention in the form of bank regulation was necessary in order to develop a widely accepted means of payment and an integrated money market.

We contribute to two other strands of the literature. First, there is a long literature using interest rate dispersion to measure financial integration in other countries. For instance, Klovland and Øksendal (2017) study interest rate dispersion in Norway in the period 1850 to 1892, Mitchener and Ohnuki (2009) study data for Japanese prefectures between 1884 and 1925, Nogues-Marco et al., (2019) studies Spanish money market from 1825 to 1874 and Good (1977) studies financial (dis)integration in 19th century Austrian data. Interestingly, several of these studies attribute the level of integration to transaction costs. Nogues-Marco et al., (2019) argue that improvements in roads and the postal service reduced transaction costs before the advent of railways, Mitchener and Ohnuki (2009) find that the expansion of the telegraph along with branch networks reduced dispersion in Japan and Klovland and Øksendal (2017) give a central role to advances in communications. In contrast, we show that these transaction costs were already relatively low in Switzerland in the 1850s and certainly by the 1860s but that segmentation persisted. Indeed, we argue that other barriers to competition, specifically, the protection of local monopolies and conversion risk, were more important drivers of segmentation.

Several studies have considered financial market integration in the US. Davis (1965) studies regional US interest rates to measure integration in the post-bellum period.[1] He finds a trend towards integration, particularly as measured by short-term interest rates, and attributes this to the development of a national commercial paper market which helped overcome geographical and institutional barriers such as restrictions on branch banking. In contrast, Sylla (1969) argues that regulations on national banks brought in by the Banking Act of 1864 created barriers to entry that prevented the narrowing of interest rate differentials across regions of the US. Sylla argues that a relaxation of these regulations in 1900 was an important cause of a subsequent convergence in differentials. Subsequent papers have attempted to test the Davis and Sylla hypotheses. Smiley (1975) presents new interest rate data and, observing movements in these data graphically, argues in favour of the Davis (1965) capital markets

[1] See Bodenhorn (1992) for a study of the financial market integration in the ante-bellum period.

hypothesis. On the other hand, James (1976) comes down in favour of Sylla (1969), arguing however that the relaxation of bank regulations was less important than Sylla believed, since the growth of non-national banks created competition.[2] In this study, we also argue that banking regulation can play a key role in financial market integration, however, contrary to Sylla, we argue that in the case of Switzerland it increased the degree of financial market integration.

Second, the extant literature also emphasizes the importance of the Swiss Banknote Act of 1881 in shaping the financial system. Pointing to a weak exchange rate and contemporary accounts of movements of specie to France of 'phantastic dimensions'[3], Neldner (1998, 2003) articulates the prevailing view that the Banknote Act had a destabilizing effect by creating a free-rider problem that led to over-issuance of banknotes and an undervaluation of the exchange rate.[4] Herger (2022) develops testable hypotheses based on the model of Miron (1986) and argues similarly. We do not challenge the findings of these studies, which are both intuitive and convincing. Instead, we focus on a different impact of the Banknote Act: its effect on money market integration. To our knowledge, no previous study has considered this aspect. Indeed, while the earlier literature finds a negative impact of the Act on the stability of the system, our analysis suggests that it also played a positive role from the perspective of nation-building, as it created a unified monetary system in Switzerland. Interestingly, it is exactly the mechanism that Neldner believes led to over-issuance – the reduced incentive for customers to discriminate between notes – which we argue is one key element which led to increased integration.

The remainder of the paper is structured as follows. In the next Section we provide a brief historical background, detailing free banking in Switzerland from the introduction of the Swiss Franc through the periods of unfettered and regulated free banking. We then present our data and our strategy for quantifying dispersion. In Section 4 we discuss structural issues which prevented market integration under unfettered free banking and the mechanisms through which the Banknote Act addressed these issues, and in Section 5 we use the

[2] Choi and Dupont (2007) also argue in favour of the Sylla hypothesis over that of Davis.
[3] Jöhr, 1915, p. 240, translated by Neldner (1998).
[4] See Meyer (1903) for an early contribution.

counterfactual of Norway to attempt to quantify the importance of these structural issues in causing discount rate dispersion. In Section 6, we discuss the evidence for whether integration would have occurred at a later date in the absence of the Banknote Act. Section 7 concludes.

2. Historical background: from unfettered to regulated free banking

The first Swiss banknotes were issued by the *Deposito-Cassa* of the city of Bern in 1825. Since there was no national currency at the time, the banknotes were backed by various metallic coins whose value customers found difficult to judge and costly to exchange. Thus by 1850, banknotes generally only circulated in the immediate vicinity of the issuing bank (Jöhr (1915)) and were often denominated in foreign currency (see Nyborg (2019)).

Following the foundation of the modern Swiss confederation in 1848, Swiss Franc coins were introduced in 1850. The new Swiss currency was designed as a pure silver currency with the same parity as the French Franc (Willis (1901)).[5] The introduction of the Franc was successful in standardizing the currency and by 1852 the replacement of predecessor currencies was mostly complete ((Niederer (1965)). As a result, banknotes were generally denominated in Swiss Francs thereafter.

However, the issuance of banknotes remained a competitive business. The Confederation did not regulate banknote issuance and so it was left to the cantons to determine rules for note issuing banks. As a result, they were lightly regulated, causing the period to be referred to as one of "unfettered free banking" (Herger (2022)). Indeed, Fick (1863, p.87) noted that "nowhere in Switzerland are bank laws in place in the sense of regulations for the control of existing and the permission of new banks".[6] This situation had changed a little by the late 1870s. Five cantons had some form of regulation by about 1880. Zurich and Fribourg had requirements relating to the reserve ratio, while Schaffhausen and Zurich required approval from the local government for note issuing. In addition, Solothurn and Neuchâtel only gave

[5] However, there was one significant difference: France was on a bimetallic standard, while the Swiss standard was purely silver. This caused various problems when the relative prices of gold and silver shifted, and in 1860 a revision of the Coinage Act made French gold coins (as well as equivalent gold coins of other countries) legal tender (see Baltensperger and Kugler (2017)).

[6] As translated by Fink (2014, p. 5).

the cantonal banks the right to issue notes.[7] In addition, six other cantons had a banknote tax of at most 1% of the circulating notes' face value. However, there was no uniformity across the Confederation, and regulation was generally very limited.

Despite the lack of regulation, the period is frequently considered an example of stable free banking. Weber (1988) and (1992) argues that there was no overissuing and there were almost no failures among the note-issuing banks. Indeed, Herger (2022) notes that between 1826 and 1907, there were just two panics, one in 1859 at *Banque Générale Suisse* and the second in 1869 at *Eidgenössische Bank*, and one failure (*Banque Cantonal du Valais*) in 1870, but that no banknote holder suffered losses as a result.

On the other hand, in a report to the National Monetary Commission of the US Senate, Landmann (1910, p.19) argues that during this period, "disregarding all banking principles, [the banks] entered into every conceivable transaction for the sole purpose of bringing the largest possible amount of their notes into circulation" and that "not without reason" (Landmann (1910, p.11)) the public doubted the security of banknotes issued. Either way, it is generally recognized that the market remained fragmented: banknotes were not standardized in form or quality, and as a result monitoring costs were high (Herger (2022)) and banknotes were generally illiquid. Indeed, these issues with payments infrastructure led Ritzmann (1973) to conclude that the period of unfettered free banking was ultimately unsustainable.

The problems in the payment infrastructure were laid bare during the Franco-Prussian War. At the start of the war, France raised the discount rate, prohibited gold exports and suspended banknote convertibility. For Switzerland, which minted few coins domestically, the resulting liquidity shortage led to the "*Geldcrisis*" of 1870. Swiss banks could not meet payments obligations or extend credit and some cantons had to impose a general payments moratorium (Baltensperger and Kugler (2017)). The crisis only eased when the authorities declared the English Sovereign and the American Dollar legal tender, enabling Swiss banks to obtain currency by transferring holdings of bills drawn on these currencies into coin (Baltensperger

[7] See Fink (2014) for a detailed discussion of regulations.

and Kugler (2017)). This eased the liquidity crisis considerably and, also because the war ended quite quickly, the period of monetary crisis was in the end relatively brief.

Although the crisis was short-lived, the serious deficits that it uncovered in the payments infrastructure had significant ramifications for the Swiss financial sector. It had proven impossible for the Confederation authorities to negotiate a joint solution among the banks to deal with the liquidity shortage. Banks refused to accept notes drawn on their competitors as this would drain their reserves.[8] In 1874, an amendment to the Federal Constitution gave the Confederation authority to pass legislation governing the issue and redemption of banknotes. Although a popular vote in 1876 rejected a further amendment to improve the payments infrastructure by unifying banknotes and ensuring acceptance at par, the 1874 amendment enabled the Banknote Act of 1881. This brought in several requirements to improve the payments infrastructure in addition to the acceptance of notes at par, including metal reserve and equity capital requirements, the standardization of banknotes in terms of size and denomination and Federal regulation of note issuers with regular reporting requirements.

Combined with the scarcity in failures of note-issuing banks, the Act was successful in making banknotes widely accepted. In 1898 the *Banque du Commerce de Genève* stated in its annual report that notes "circulate without distinction", while Jöhr (1915, p. 203) states "indeed, the ordinary man, in course of the years, ceased to differentiate between the notes of the various banks. If the notes carried the name and signatures of this or that bank, was no longer taken into consideration".[9] This anecdotal evidence suggests that the Banknote Act may have led to a more integrated money market. However, the effect of the Act on integration has not previously been quantified. We next turn to this issue.

3. Quantifying discount rate dispersion

3.1 A new daily data set for six Swiss cities

[8] It also highlighted the lack of a lender of last resort. This issue was not resolved until the founding of the Swiss National Bank in 1907.

[9] Translations reported by Neldner (1998).

We assembled daily discount rate data for seven note-issuing banks from 1846 to 1893. The start date coincides with the foundation of two of the banks in our sample, the *Banque Cantonal Vaudoise* (located primarily in the city of Lausanne) and *Banque du Commerce de Genève*. The other banks in our sample are in Basel, Bern, St. Gallen and Zurich. All banks were large within their region and all were important note issuers. The end date of our analysis, 1893, coincides with the announcement of a single discount rate by the note issuing banks for all of Switzerland.[10] In general, we attempted to collect discount rates for "high quality" short-term bills, although we cannot verify this in all cases. A full list of sources is provided in Table 1; briefly, the data are collected from annual reports, newspapers, and daily exchange sheets. In general, we obtained data for the same bank throughout the sample. The exception is in Zurich where, because the *Bank in Zürich* stopped announcing discount rates and withdrew from the banknote business, we spliced together data for two banks. We discuss the case of Zurich further below.

In contrast to existing work by Jöhr (1915) we collected discount rates for two more cities (Bern and Lausanne, in addition to Basel, Zurich, St. Gallen and Geneva), another bank type (state-backed cantonal banks in Bern and Lausanne, in addition to private banks) and at a higher frequency (daily rather than annually).[11] This allows us to identify changes in discount rate dispersion at high-frequency.

The data are presented in Figure 1. For the analysis, we aggregate the data to a weekly frequency.[12] This reduces measurement error arising from the fact that, depending on when in the day a rate change announcement was made and how many editions a newspaper might print, the public announcement may or may not lag by a few days. Overall, discount rates generally increase in all regions in the early part of the sample. There are three periods of high discount rates: in the late-1850s, mid-1860s and early-1870s. Thereafter the discounts generally decline, with one spike in the early-1880s. However, while there is a broadly similar pattern

[10] In practice, note-issuing banks deviated from the publicly announced rate. Although Hauzenberger et al. (2022) assembled data on a "private rate", that is a commonly agreed lower limit for discounts, we have no information on the rates applied by the individual note-issuing banks.
[11] Jöhr (1915) reports annual averages and the number of discount rate changes. We cross-checked our daily data with his annual statistics for four cities and find very similar results.
[12] The results are robust when using data at daily or monthly frequency.

across the cities during the period, this alignment is not perfect. For instance, while discount rates in all cities increase in the aftermath of the Franco-Prussian war, the route to normalisation is different across cities.

It is notable that discount rates in Lausanne and Bern change less frequently than elsewhere, particularly in the early part of the sample. Both of these are cantonal banks, which were set up with some degree of public backing, although they operated as commercial banks and cannot be considered a local "central bank" with a monopoly on note issuance. Nonetheless, one question is whether rate setting behaviour at cantonal banks was different from other banks. To consider this further, we compare data for our two banks in Zurich, one of which is a private bank (*Bank in Zürich*) and the other a cantonal bank (*Zürcher Kantonalbank*). For these banks we have overlapping data between December 1870 and February 1882.[13] As is evident in Figure 2, the two banks set very similar rates during this time: the correlation coefficient between the series is 0.97, the medians of the two series are the same and the means are within 10 basis points of each other. Thus, it does not seem to be the case that cantonal banks as a rule set discount rates differently from private banks: instead the lower frequency of rate changes in Bern and Lausanne appears to be a feature of the local market and reflects the large degree of autonomy in discount rate setting due to market segmentation.

3.2 Measuring dispersion

We use the dispersion of interest rates as a measure of the integration of the financial system. Our preferred measure of dispersion is the root mean squared deviation (RMSD) of the six discount rates. The RMSD is calculated as follows:

$$RMSD = \sqrt{\frac{\sum_{i=1}^{N}(r_{i,t} - \overline{r_t})^2}{N}}$$

Where $r_{i,t}$ is the discount rate in city i in month t, and $\overline{r_t}$ is the average of the six discount rates in month t. Since there are six Swiss cities, $N = 6$. While the choice of dispersion measure is arbitrary, we show in Appendix A that six alternative measures of dispersion lead to almost

[13] The final Zurich series used in the analysis relates to the *Bank in Zürich* from 1846 until data from the *Zürcher Kantonalbank* becomes available at the end of 1870.

identical conclusions. The RMSD of the discount rates is presented in Figure 3. A decrease in the RMSD of discount rates is interpreted as an increase in integration.

Figure 3 shows a pronounced spike in discount rate dispersion in October 1863, which Bleuler (1913, p. 78-81) suggests followed increases in the discount rates in Paris and London, which were in turn partly triggered by the American Civil War and the associated increase in cotton prices. He reports that the *Bank in Zürich* initially kept discount rates relatively low but increased them substantially in the second half of the year. According to Bleuler, the reserves of the *Bank in Zürich* declined and it sometimes refused to discount commercial paper. The spike in dispersion shows that the various Swiss banks did not uniformly follow suit. In addition, the collapse of Overend Gurney[14] and the Austro-Prussian War in 1866 was associated with a long-lasting increase in uncertainty. The high and dispersed discount rates observed during these periods indicates the lack of a uniform and widely accepted means of payment in Switzerland.

Eyeballing Figure 3, it is evident that, following a decline in dispersion around the time of the introduction of Swiss Franc coins, there is no discernible decrease in the RMSD over the following 30 years. However, there is a clear break and decline in the RMSD in the early 1880s, the period when the Banknote Act was introduced. More formally, we conduct Bai-Perron breakpoint tests for a break in the mean of the RMSD (see Appendix B for details of the breakpoint test procedure). We find breaks in late 1853, late 1863 and early 1881. The mean levels of dispersion in each sub-period are included in Figure 3. Unsurprisingly, the first break, which roughly coincides with the Swiss Franc replacing the pre-existing plethora of coins, results in a decline in dispersion. This suggests that the introduction of a common metallic currency also contributed to money market integration. The break in 1863, during the 30 years of unfettered free banking, results in an increase in dispersion, implying that the integration actually declined during the period. However, the break in 1881 coincides with the Banknote Act and leads to a decisive decline in the dispersion of discount rate.[15]

[14] Overend, Gurney & Company was a London-based bank which failed in 1866 causing a panic.

[15] Specifically, the break occurs at the week beginning April 14, 1881. The Banknote Act was passed less than a month before, on March 15, 1881 (see Landmann (1910)) although it took effect only in 1882 (see

Given that, as already noted, there were attempts at regulating the note issuance in the preceding years, one might expect an "anticipation effect" where the break happens in advance of the Banknote Act. Indeed, when we conduct a robustness (see Appendix C) where we drop one city in turn and search for breaks in the RMSDs for the remaining five cities, any variation we find in the break date (as we do when we drop the discount rate in Lausanne) results in the break occurring somewhat earlier (late 1879), which is reassuring for our hypothesis that the regulation of free banking was a key event in this period.

Overall, it seems that private regulation did not lead to an integrated market but that public regulation did. Why that was is considered in the next section.

4. Why was there no integration before 1881?

We identify two channels through which the Banknote Act may have impacted the dispersion of discount rates: an end to local monopolies and a diminution in so-called conversion risk. We consider each in turn.

4.1 Local monopolies

In the literature, a lack of competition is often attributed to information or transportation barriers (Mitchener and Ohnuki (2009), Nogues-Marco et al., (2019), Klovland and Øksendal (2017)). However, in Switzerland, such barriers were not serious obstacles to competition. Postal services and telegraph infrastructure were centralized with the Federal Constitution. In 1850, there were already 1500 postal offices operated by the newly founded *Eidgenössische Post* (Kronig (2011)). The first telegraph line came into operation in July 1852 and by 1853, the telegraph network already included 70 locations (Buschauer (2013)).[16] The first railways in Switzerland started to operate before 1850 connecting Basel and Strasbourg (1844) and Zurich and Baden (1847) (Bärtschi and Dubler, 2015). The railway boom started in earnest in 1855, shortly after the first break in our measure of dispersion. The railway network expanded from

Table D in the Appendix). This points to an anticipation effect or may reflect estimation uncertainty inherent in the breakpoint tests.

[16] Moreover, a reduction of information lags is unlikely to explain changes in persistent differences in discount rate dispersion. Specifically, we find very similar results with monthly data, we therefore argue that improved communication is not the main driver of the decline in discount rate dispersion.

38km in 1854 to 210km in 1855 and 1052km in 1860 (HSSO, 2012). However, there is no decline in dispersion during this five-year period suggesting that transportation costs, at least for shipping banknotes, were already low. Moreover, Switzerland is a small country. The straight-line distance between Geneva and St. Gallen is 281 km. For instance, to travel about half that distance – from Bern to Geneva – took about 20 hours using a *Diligence*, a carriage transporting nine people drawn by four or five horses. Finally, most internal barriers to trade were abolished following the establishment of the Confederation in 1848.[17]

The above suggests that competition was strong during this period. However, that is only part of the story. Even in the face of low transaction and transportation costs, banks of issue protected local monopolies. Specifically, the case of the *Eidgenössische Bank* illustrates how incumbents protected their local markets (Gygax, 1907, p. 216ff.). The *Eidgenössische Bank* was founded as a private bank at the end of 1863 with the aim to become Switzerland's first universal bank, being active as a deposit, mortgage, note-issuing, and loan bank ("credit mobilier") (see Ritzmann, 1973, p. 67ff.). In contrast to other private and cantonal banks, it quickly established branches throughout Switzerland.

However, if one bank was to offer banknotes that circulated in all regions, there was a clear danger that these banknotes became the most useful and most widely circulating means of payment, threatening the lucrative cantonal de-facto banknote monopolies. Indeed, achieving a monopoly on note issuance for the whole country was the aim of *Eidgenössische Bank.* Thus, the existing banks sought to ward off the competition by establishing multilateral agreements on banknote conversion. The *Bank in St. Gallen* contacted two other banks arguing that a "*Konkordat*" or cartel agreement would enlarge circulation in the interest of all three banks but also: "counter the encroachments of the *Eidgenössische Bank* in Bern into the territory of the three designated banks as far as possible" (cited in Bleuler, 1913, p. 271). The private banks in Basel, St. Gallen, and Zurich agreed on 19 September 1864 to convert their banknotes at par value (see Table D in the Appendix). This cartel agreement became known as the *Alte Konkordat*, the old accord.[18]

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[17] Before, there were about 180 customs stations between cantons (Polli-Schönborn (2015)).

[18] Starting in 1865 these banks even discussed emitting a common banknote (see Table D in the Appendix). However, these negotiations did not succeed.

Moreover, pre-existing local banks tried to undermine the credibility of their new competitor (see Ritzmann, 1973, p. 69 and Gygax, 1907, p. 216ff.). The *Bank in St. Gallen* discussed in an internal protocol from 1865 whether it should take measures to hamper the circulation of banknotes by the *Eidgenössische Bank*. On the one hand, the protocol suggests that the new competitor negatively affects the interests, that is profits, of the stock holders. On the other hand, it suggests that it may be a problem that the *Eidgenössische Bank* engages in other, potentially, risky businesses which did not correspond to best-practices of a conservative note-issuing bank. The board of the *Bank in St. Gallen* then organized a conference with the *Kaufmännische Direktorium*, an important and powerful chamber of commerce in St. Gallen, and another credit bank to discuss measures. They decided to boycott the "foreign" or "wild" banknotes of the *Eidgenössische Bank*. In addition, the *Bank in St. Gallen* tried to convince the *Kaufmännsiche Direktorium* to help publicly denounce the *Eidgenössische Bank* (see Gygax, 1907; p. 217, own translation):

"It would be appreciated if all money institutes would draw the public's attention to the danger of accepting banknotes that are not covered according to recognized principles, and that they would set a good example and declare that they will stop accepting these notes at their cash desks altogether."

The example shows that, although there is some evidence that *Eidgenössische Bank* was indeed not particularly well-run, the campaign against it was surely motivated by self-preservation and profit motives on the part of the incumbent banks, rather than an altruistic desire to protect the wider public.[19] As a result of the existing banks' efforts, the public did not fully trust the *Eidgenössische Bank*, and its banknotes in circulation remained relatively modest.

Overall, as a result of incumbents' ability to protect their local monopolies, banknotes were illiquid and did not circulate widely. This is evidenced by how little time notes were in circulation: for instance, Mangold (1909) states that notes of the *Bank in Basel* spent on average only 36 days in circulation in 1855.[20] Thus, despite the lack of information and transport

[19] Nyborg (2019), p. 127, suggests that the bank's Zurich branch was subject to a run after it misappropriated funds.

[20] Indeed, Landmann (1910, p.11) reports that "outside their home Canton they [banknotes] could either not be given in payment at all or only at a certain discount". This situation ensured note issuers benefited from lucrative local monopolies.

barriers, the ability of incumbents to protect their local monopolies meant that there were limited means to take advantage of arbitrage opportunities arising from discount rate dispersion.

By requiring banks to accept all notes of official banks of issue at par, the Banknote Act destroyed local monopolies. That is important because although the six banks in our sample were note issuers, less than 10% of all banks engaged in issuance.[21] A question that arises is whether note issuing was a large enough part of banks' business for the Banknote Act to impact discount rates. However, by ending local monopolies and making banknotes more liquid, the Banknote Act opened note issuers up to more competition in the discount market. Indeed, Neldner (2003, p.398) notes "In their effort to protect and enlarge their share in the loan market, the credit banks often undercut the discount rates of their note-issuing rivals, thus forcing them to pursue a less restrictive course, in order not to be thrown out of business". This is evidenced in the generally lower discount rates in the aftermath of the Banknote Act evident in Figure 1[22], in addition to the reduction in discount rate dispersion.

4.2 Conversion risk

The second mechanism that we identify is conversion risk, which is defined by Miron (1986) as the risk that there is a run on the bank, such that the bank must convert large quantities of notes to specie. Herger (2022), based on work by Miron (1986), shows theoretically that higher conversion risk leads to higher discount rates: that is, when banks perceive the risk of a run has increased, they increase discount rates to increase the ratio of reserves to notes in circulation. If there is variation of conversion risk between banks, which seems quite likely since banks were not uniformly regulated and since conversion risk depends also on public perceptions of their financial soundness, this will lead to discount rate dispersion.

The Banknote Act reduced conversion risk through two channels. The first is the same channel through which it increased the risk of over-issuance of banknotes: by requiring all banks to accept notes at par, the Act spread some of the risk of instability in a single bank across the

[21] We are grateful to Peter Kugler for noting this.

[22] Taxation of notes under the Banknote Act also encouraged issuance up to a fixed ceiling, which is also likely to have contributed to a reduction in the discount rate.

entire banking system. Customers then had less incentive to monitor banks' balance sheets since they knew they could redeem their notes at any bank should the need arise. Thus, there was less risk that there will be a run on an individual bank, as there was less risk that a customer would be unable to convert a note issued by an individual bank.

The second channel was through reduced uncertainty: the capital and liquidity requirements, alongside reporting requirements which included the publication of balance sheet information, reduced uncertainty about the stability of individual banks and reduced the risk of a panic leading to a run on a stable bank. The overall effect of the Banknote Act should therefore be to reduce and equalise conversion risk across banks, reducing discount rate dispersion.

5. How important were local monopolies and conversion risk?

Quantifying the importance of local monopolies and conversion risk in discount rate dispersion is difficult. However, we believe that Norway provides a counterfactual that is instructive. During the period, branches of the Norwegian central bank, Norges Bank, were located across the country. Branches had discretion in setting discount rates but distributed identical notes in every location (Klovland and Øksendal (2017)). As a result, there was little to no conversion risk in Norway since the notes were backed by the central bank. Moreover, there was no incentive to protect a local monopoly since note issuers were all branches of the Norges Bank. Indeed, Klovland and Øksendal suggest that discount rate dispersion in Norway can be traced back mostly to limits to arbitrage, that is, differences in riskless interest rates arising from transportation and information costs. Thus, Norway is almost the polar opposite of Switzerland, which had low to negligible transport and information costs but had conversion risk and incentives to protect local monopolies.

Moreover, as noted by Klovland and Øksendal (2017), Norway was unique in having a note-issuing monopoly and a high degree of autonomy granted to branches: while having branch networks, the Banque de France, Bank of England, Bank of Japan and Austrian-Hungarian Bank set rates directly or maintained control to varying extents over their branch networks. In Sweden, the Enskilda banks – private note-issuers – were required to hold reserves at the Riksbank ensuring that they were responsive to changes in the official rate. Following the

establishment of the Federal Reserve in the US in 1913, regional Reserve banks could set their own discount rates only with the approval of the Federal Reserve Board.[23] Thus, Norges Bank appears the best counterfactual for our purposes.

Finally, in its broader economic and monetary arrangements, Norway was similar to Switzerland. Both were small, open economies. In both, various regions were active in quite different economic sectors and export industries. Their monetary systems were similar in the sense that Norway adopted a Silver standard in 1842 (Switzerland in 1852, soon to be turned to a bimetallic standard) and turned to the Gold standard in 1874 (Switzerland (de facto, although never officially) during the 1870s, similar to France and other members of the Latin Monetary Union).

Comparing discount rate dispersion between our six Swiss cities and the six most important branches in Norway, it is evident that the dispersion in Norway was on average lower (see Figure 4).[24] The difference was especially large before the introduction of the Swiss Franc in 1852, suggesting that the common Swiss currency contributed to financial integration as well, but then gradually declined. Nonetheless, with a few temporary exceptions, the difference remained positive until the early 1880s. The difference in dispersion declined sharply around the time the Banknote Act was introduced in the early 1880s.[25] Afterward, the difference was low, or even negative, until the end of our sample.[26]

Overall, the Norwegian counterfactual provides suggestive evidence that the combination of conversion risk and local monopolies in Switzerland added markedly to the dispersion of discount rates in the period of unfettered free banking. By the 1880s, Norway still experienced a lack of competition due to transport and information costs while the Banknote Act reduced

[23] Of course, during the 19th century US banks had a high degree of autonomy in setting rates, but since there was no monopoly on note issuance, it is a poor counterfactual.

[24] Since the Norwegian data are end-month values, we also use end-month data for Switzerland. The six Norwegian cities that we use are: Bergen, Christiania, Christianssand, Drammen, Skien and Trondhjem. Data for all of these cities are available from 1846 to the end of 1892.

[25] Interestingly, we also observe a decline in dispersion in Norway in the late 1870s. However, the decline occurs before 1880 in Norway and at almost exactly the same time of the introduction of the Banknote Act in Switzerland.

[26] Indeed, a Chow (1960) test rejects the null of no break in the average of the difference in dispersion in April 1881 (p-value = 0.00).

or removed dispersion arising from conversion risk and local monopolies in Switzerland. As a result, it seems reasonable that the dispersion is lower (and integration higher) in Switzerland than in Norway by the end of the sample.

6. Did the public authorities step in "too soon"?

Was it inevitable that private regulation would fail to integrate the market? Selgin and White (1987, p. 446) expect the banks to ultimately accept one another's notes at par if transaction and transportation costs are low enough, because each bank has an incentive to accept the notes from other banks in an effort to increase the circulation of its own notes. Indeed, contemporaries hoped that with the introduction of the Swiss Franc coins, mutual agreements between all banks in Switzerland to accept notes at par would lead to more financial market integration (BEKB, 1851, p. 5).

We have shown that there was no evidence of an increasing trend in integration over the 30-year period from the early 1850s to 1881. While this suggests that public regulation was necessary, perhaps integration is not a gradual process. Maybe a large increase in integration would have occurred at the end of a long process which the Banknote Act cut short. Indeed, cartel agreements to accept notes at par were made several times during this period. They involved the formation of accords or cartels, such as the *Alte Konkordat* referred to above. One problem of such accords was that they were limited to a subset of banks that did not necessarily meet the needs of consumers. Another problem was that there was no legally binding enforcement: if one bank got into trouble, others could simply suspend their accords with it. These accords therefore included an inherent uncertainty which may have rendered them unstable and reduced their value. For example, in the wake of the Franco-Prussian war, the *Bank in Zürich* publicly retained the right to refuse banknote conversion despite existing agreements (see Table D in the Appendix).

Prior to the *Alte Konkordat*, several other accords had been attempted between banks on a bilateral basis. The Table in Appendix D provides a list of the most important accords from the perspective of the six banks in our sample, but also from banks in smaller cities ("*Nebenplätze*"). Basel and Zurich agreed to convert their new banknotes, but not at par, in 1852. The same holds for an accord between Basel and St. Gallen from 1852. There existed an

accord between Bern, Fribourg, Vaud, and Geneva to convert banknotes, as well as an accord between *Banque Cantonal Vaudoise* and *Bank in St. Gallen* on the same terms in 1853. However, this agreement failed on 1 December 1853 and the *Berner Kantonalbank* again introduced fees for banknote conversion, which differed according to the counterparty. These fees tended to decline towards the end of the 1850s for several accords, however, we do not know of an accord between two major banks that converted their banknotes at par until the 1860s. Moreover, the Table illustrates the complicated and sketchy web of accords that existed during the period, which would have been difficult for customers to keep track of.[27]

The *Alte Konkordat* therefore appears to be an improvement on the earlier bilateral accords since it involved several banks. But precisely because the purpose of this accord was to defend local monopolies, it cannot be expected that it would eventually have led to widespread banknote acceptance and money market integration.[28] Smaller banks asked in December 1864 to join the agreement, or alternatively to dissolve the cartel (Nyborg (2019, p. 158)). However, the *Alte Konkordat* banks dismissed their demands. Therefore, the smaller banks, with the help of the *Eidgenössische Ban*k, not only set up their own agreement to convert their banknotes mutually at par, but also introduced a fee to convert the banknotes of the *Alte Konkordat*.[29] Thus, it seems unlikely that the *Alte Konkordat* was a stepping-stone to universal banknote acceptance.

A second multilateral accord was formed in 1876. Twenty (later 28) banks ("*Konkordatsbanken*") agreed to convert each other's notes at par. Perhaps this was the catalyst needed to achieve money market integration? That may have been, but the driving factor behind this accord was again defensive: in the wake of the failure of the constitutional referendum to unify banknotes in 1876, the commercial banks formed the accord to try to pre-empt any further attempts at regulation (Baltensperger and Kugler (2017)). As a result, it

[27] Indeed, we have found several newspaper examples in the 1870s in which readers are reminded of which banks are involved in accords. This particularly relates to the *Konkordatsbanken* discussed below.
[28] The banks of the *Alte Konkordat* only ever agreed to accept notes with a face value of 50CHF at par.
[29] Interestingly, older bilateral accords with the individual members of the old concordat remained in place and in some sense they may have simplified the monetary system within the two blocks, but the exceptions from the bilateral accords still implied that there was considerable uncertainty at which bank one could convert any given banknote at par.

seems unlikely such an accord would have been agreed without the threat of public regulatory initiatives.

Overall, it seems unlikely that Swiss banks would eventually have accepted each other's notes at par as Selgin and White (1987) suggest. Bilateral accords were complicated and rarely led to conversion of notes at par. Multilateral accords to accept notes at par were prompted by defensive motives such as maintaining local monopolies or avoiding regulation. Thus, the aims of the accords were entirely contrary to general par acceptance of banknotes. Moreover, without an enforcement mechanism, accords could fail at times of financial stress, that is, precisely when the system might need liquid assets the most.

7. Conclusion

In this paper we considered the role of payments infrastructure in developing money market integration in Switzerland during the era of free banking. In particular, we asked whether private markets alone could create the infrastructure necessary for money markets to integrate, or whether public intervention was needed to drive the necessary changes.

Following the establishment of the modern Swiss Confederation in 1848, Swiss Franc coins were introduced as legal tender, but banknote issuance remained a competitive business, regulated, if at all, at cantonal level. The subsequent period of unfettered free banking was ended by the Banknote Act of 1881 which addressed gaps in the payments infrastructure by regulating note issuing banks at the Confederation level for the first time.

Using newly collected daily discount rate data for six Swiss cities to measure the integration of the Swiss market, we find that discount rate dispersion actually increased during the period of free banking, and that it was only with the Banknote Act that it decreased. We attribute the failure to integrate during the unfettered free banking period to two structural issues which the private sector was not well-placed to address. First, we argue that banks protected local monopolies and formed cartels to ensure competition was limited. This was despite the fact that transport and information costs were low in Switzerland throughout most of the period. Second, free banking brought with it a relevant risk of a bank run (conversion risk) which was heterogeneous across banks at any point in time. This risk was reflected in discount rate dispersion.

To quantify the effect of these two structural issues, we use Norway as a counterfactual. While Norway was at a similar stage of economic development and had a comparable monetary regime to Switzerland, it also had a central bank with a monopoly on note issuance. However, since branches had autonomy to set discount rates in different Norwegian regions, discount rate dispersion existed due to transport and information costs, despite the absence of conversion risk and without the incentive to protect local monopolies. We find that with the Banknote Act discount rate dispersion in Switzerland fell to a similar level as in Norway. This is further evidence that bank regulation contributed to money market integration.

We also argue that there is little evidence to suggest that in the absence of the Banknote Act integration would have occurred sometime after 1881. The cartels that were formed to accept notes at par were usually defensive in nature: they excluded competitors in an attempt to protect local monopolies, or they were motivated by a desire to ward off public regulation. In addition, there was a risk that banks reneged on these private agreements during times of financial stress. Thus, despite these private agreements, we find that the Swiss money market only integrated once the Banknote Act was passed.

Overall, we find little evidence that, left to its own devices, the private sector alone would have generated an integrated money market. We believe that this is a relevant finding in light of recent discussions about the potential popularity of new forms of private money and the need (or lack thereof) to regulate them.

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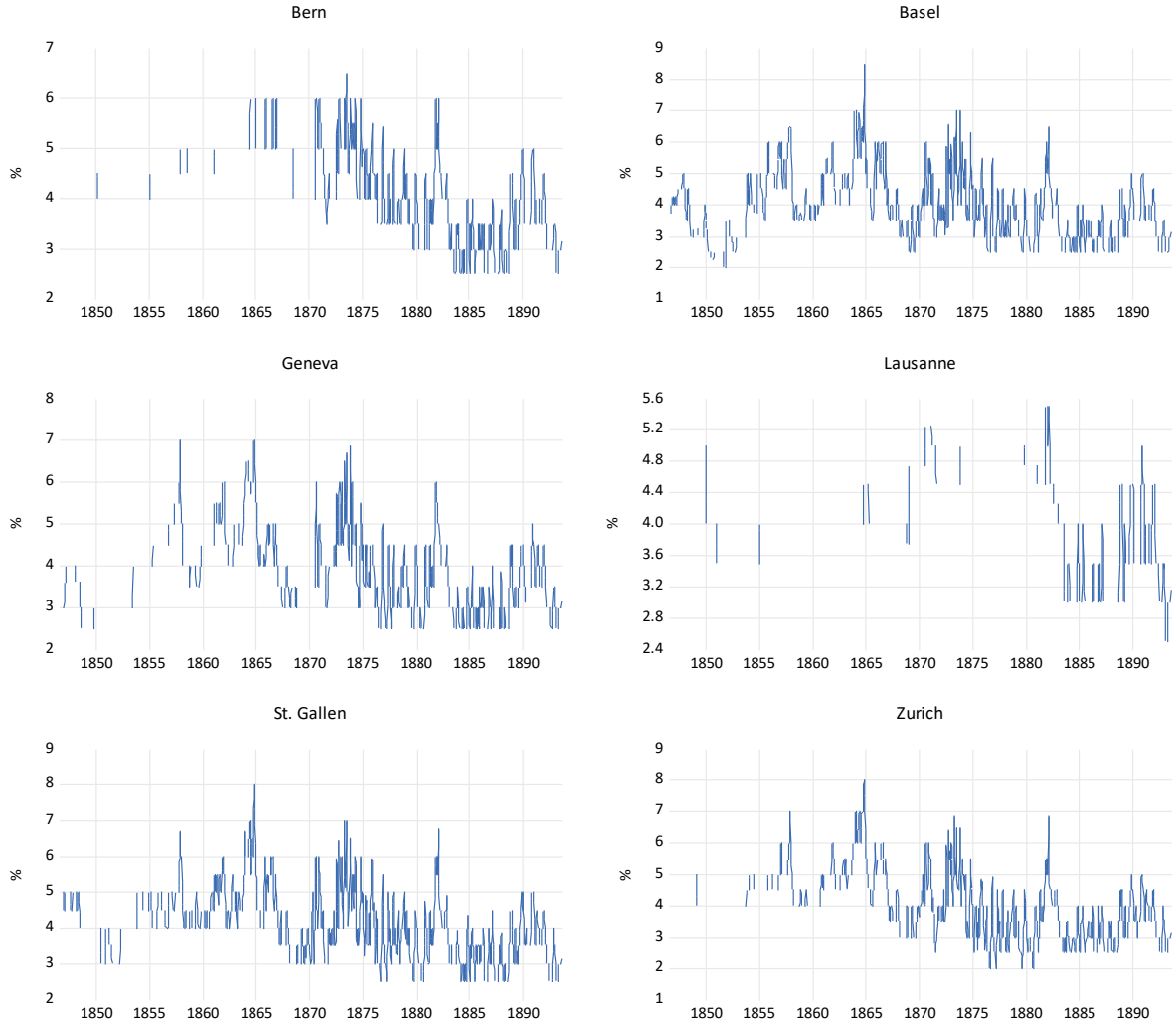
Table 1: Data sources

City/Bank	Period	Document	Source	Comments
Basel Bank in Basel	1845 - 1848	*Annual report*	*Wirtschaftsarchiv Basel*	In addition, some missing months interpolated with information from Jöhr (1915)
	1849	*Basler Tagblatt*	*Universitätsbibliothek Basel*	
	1850-1863	*Annual report*	*Wirtschaftsarchiv Basel*	
	1864	*Basler Tagblatt*	*Universitätsbibliothek Basel*	
	1865	*Basler Nachrichten*	*Universitätsbibliothek Basel*	
	1866-1868	*Annual report*	*Wirtschaftsarchiv Basel*	
	1869	*Basler Nachrichten*	*Universitätsbibliothek Basel*	
	1870-1871	*Annual report*	*Wirtschaftsarchiv Basel*	
	1872-1873	*Basler Zeitung*	*Wirtschaftsarchiv Basel*	
	1874-1882	*Kursblatt der Basler Börse*	*Wirtschaftsarchiv Basel*	
	1883-1893	*Annual report*	*Wirtschaftsarchiv Basel*	
Zürich Bank in Zürich and Zürcher Kantonalbank	1838-1841	*Annual report*	*Wirtschaftsarchiv Basel*	
	1842	*Free text search*	*e-newspaperarchives.ch*	Cross-checked with Jöhr (1915)
	1843-1845	*Annual report*	*Wirtschaftsarchiv Basel*	
	1846	*Free text search*	*e-newspaperarchives.ch*	Cross-checked with Jöhr (1915)
	1847-1852		*Jöhr (1915)*	Because there were no changes, we directly use the annual data
	1853-1855	*Free text search*	*e-newspaperarchives.ch*	Cross-checked with Jöhr (1915)
	1856-1872	*Annual report*	*Wirtschaftsarchiv Basel*	
	1871-1893	*Annual report*	*Wirtschaftsarchiv Basel*	Data from *Zürcher Kantonalbank* rather than *Bank in Zürich*
St. Gallen Bank in St. Gallen	1837-1848	*Annual report*	*Gygax (1907)*	
	1847-1853	*Annual report*	*Wirtschaftsarchiv Basel*	
	1854-1893	*Annual report*	*Gygax (1907)*	

City/Bank	Period	Document	Source	Comments
Geneva Banque du Commerce de Genève	1845-1849	*Annual report*	*Wirtschaftsarchiv Basel*	
	1850-52		*Jöhr (1915)*	Because of very few changes, possible to infer daily rates from annual data
	1852-1877	*Quotation sheets Geneva exchange*	*Bibliothèque de Genève*	
	1872-1893	*Newspapers*	*Letempsarchive.ch, e-newspaperarchives.ch*	
Bern Berner Kantonalbank	1839-1852	*Free text search*	*e-newspaperarchives.ch*	
	1853-1893	*Annual report*	*Wirtschaftsarchiv Basel, Archiv BEKB*	
Lausanne Banque Cantonale Vaudoise	1845-1853	*Free text search*	*Scriptorium.ch*	
	1854	*Annual report*	*Wirtschaftsarchiv Basel, Archive Banque Cantonale Vaudoise*	
	1855-1868	*Free text search*	*Scriptorium.ch*	
	1869-1880	*Annual report*	*Wirtschaftsarchiv Basel, Archive Banque Cantonale Vaudoise*	
	1881-1882	*Free text search*	*Scriptorium.ch*	
	1883-1893	*SHAB, free text sesarch*	*Scriptorium.ch, e-periodica.ch*	

Figure 1: Weekly discount rates in six Swiss cities, 1846-1893



Note: Weekly data calculated as average of daily observations.

Figure 2: Discount rates of *Zürcher Kantonalbank* and *Bank in Zürich*, December 1870 and February 1882

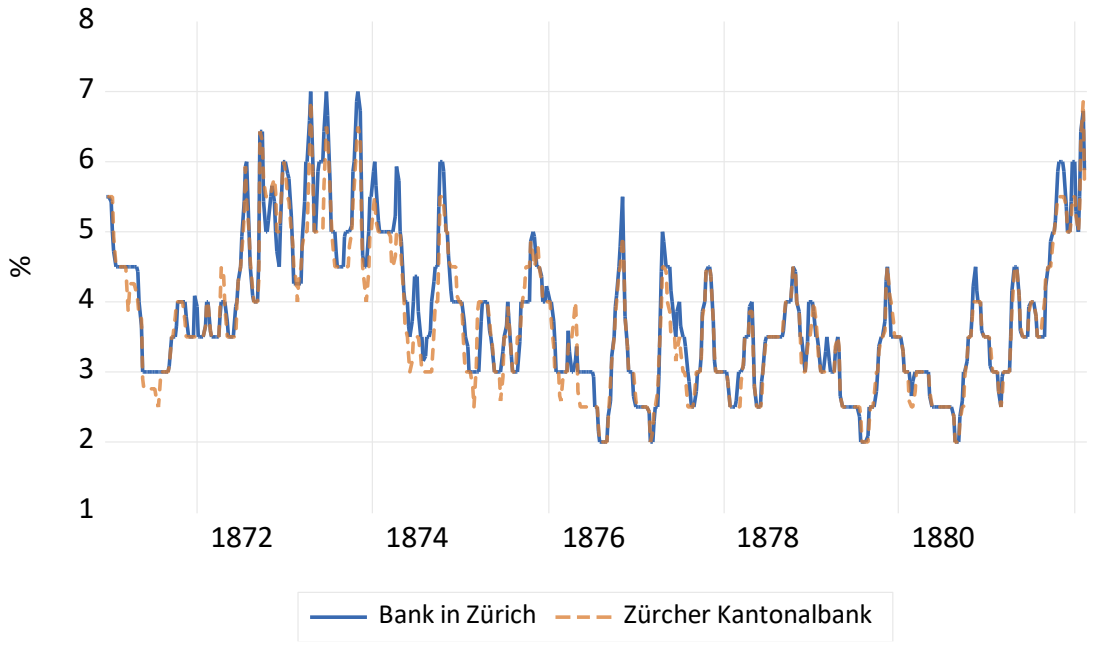
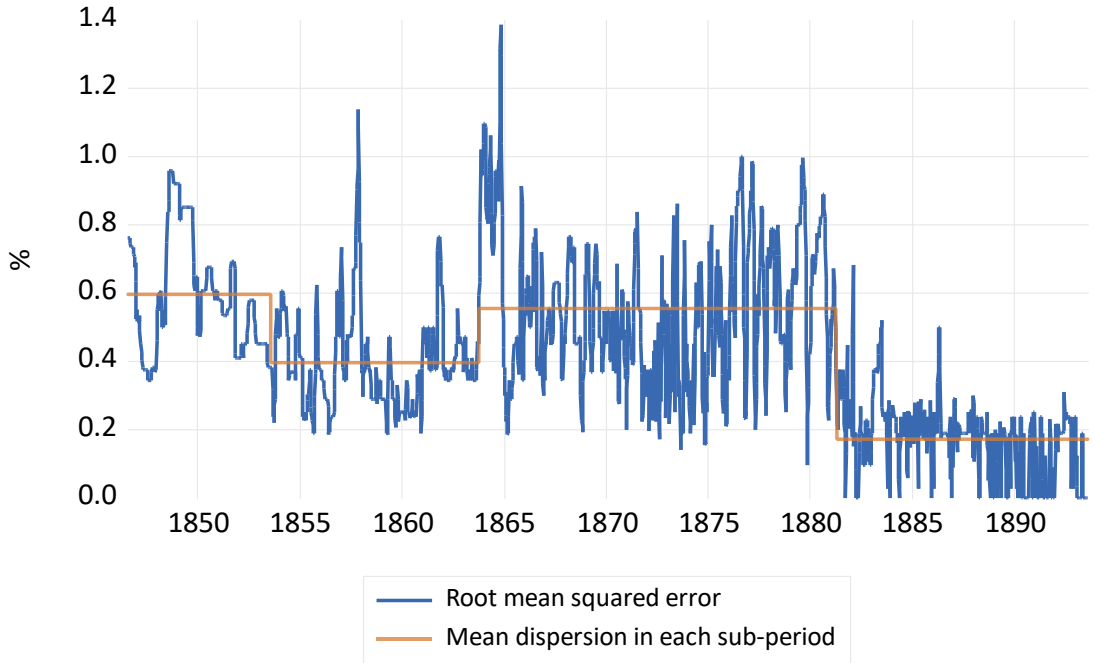
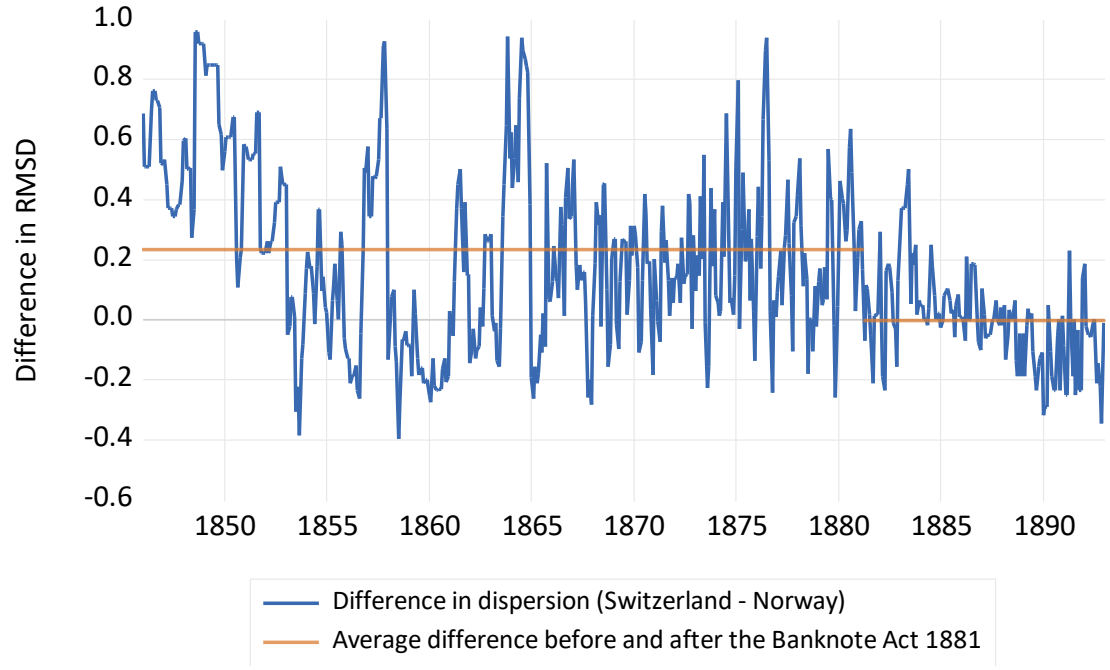


Figure 3: Weekly discount rate dispersion, 1846-1893



Note: Weekly data calculated as average of daily observations. Sub-periods determined using Bai-Perron test for a break at an unknown time (see Appendix B for a discussion of the methodology).

Figure 4: Difference in monthly discount rate dispersion, as measured by RMSDs, Switzerland and Norway, 1846-1893



Notes: Calculated as the RMSD for Switzerland minus the RMSD for Norway. End-of-month values for both countries. Following Klovland and Øksendal (2017), for Norway we exclude small branches.
Source: Norwegian data from Eitrheim and Klovland (2007). Swiss data as per Table 1.

Appendix A: Alternative measures of dispersion

In addition to the RMSD, we calculate six alternative measures of the dispersion of discount rates:

1. The range of the data.
2. Coefficient of variation ($CVAR$).
3. Mean absolute deviation (MAD_{mean}).
4. Median absolute deviation (MAD_{med}).
5. Max deviation from mean (MAX_{mean}).
6. Maximum deviation from median (MAX_{med}).

The range is self-explanatory. The coefficient of variation is calculated as the standard deviation of our six discount rates in any given week divided by the mean of those rates. The mean absolute deviation is the average absolute deviation of the discount rates from the mean of the discount rates in any week. It is calculated as:

$$MAD_{mean} = \frac{1}{N}\sum_{i=1}^{N}\left|r_{i,t} - \overline{r_t}\right|$$

Where $r_{i,t}$ is the discount rate in one of i Swiss cities in week t, and $\overline{r_t}$ is the average of the six discount rates in month t. Since there are six Swiss cities, $N = 6$. This is equivalent to the mean absolute error in forecasting.

The median absolute deviation, MAD_{med}, is equivalent to the mean absolute deviation except that instead of the using the mean, it uses the median: it is the median of the absolute deviation from the median.

The maximum deviation from the mean, MAX_{mean}, and the median, MAX_{med}, are the largest deviations from mean and median, respectively, in each week.

The pairwise correlation coefficients of the six measures and the RMSD are included in Table A1. Clearly the measures are very similar: the correlation with the RMSD is generally in excess of 0.90. The only exception is the MAD_{med} for which pairwise correlations are in the region of 0.40 to 0.70.

Table A1: Correlation coefficients, 7 dispersion measures, 1846-1893

	Range	*CVAR*	MAD_{mean}	MAD_{med}	MAX_{mean}	MAX_{med}	*RMSD*
Range	1						
CVAR	0.90	1					
MAD_{mean}	0.94	0.90	1				
MAD_{med}	0.62	0.57	0.70	1			
MAX_{mean}	0.97	0.90	0.91	0.50	1		
MAX_{med}	0.94	0.90	0.91	0.43	0.99	1	
RMSD	0.98	0.92	0.98	0.66	0.96	0.95	1

The results of breakpoint tests described in the main text for all 7 measures are presented in Table A2. Although the number of identified breaks varies between 3 and 4, in six of the seven cases, the break is identified in April 1881, immediately after the Banknote Act was implemented. The exception is the MAD_{med} measure, which we have seen from Table A1 behaves quite differently from the other measures. In this case, the break is identified in early 1880, which is still reasonably close to the date of implementation of the Banknote Act.

Table A2: Identified break dates in mean of the dispersion measures, 1846M1-1893M6

Range	*CVAR*.	MAD_{mean}	MAD_{med}	MAX_{mean}	MAX_{med}	*RMSD*
17/2/1853	2/6/1853	17/2/1853	17/2/1853	17/2/1853	17/2/1853	17/2/1853
10/9/1863	15/10/1863	15/10/1863		17/9/1863	17/9/1863	8/10/1863
	26/2/1874					
14/4/1881	14/4/1881	14/4/1881	26/2/1880	14/4/1881	14/4/1881	14/4/1881

Note: Break dates are the beginning of the subsequent sample period.

Appendix B: Discussion of break point test methodology

To consider the evolution of the RMSD more formally, we search for breaks in the mean of the series. That is, we carry out structural break tests for a break in the regression of the RMSD on a constant:

$$RMSD_t = c + \varepsilon_t \qquad (1)$$

Our method follows Bai (1997) who proposes a sequential application of breakpoint tests. In the first step, a test is run for an unknown break in the parameter across the full sample. If the test rejects the null hypothesis of constancy, a break date is identified, the sample is divided into two sub-samples and unknown breakpoint tests are performed in each subsample. A breakpoint is added whenever a subsample null of no break is rejected. The procedure is repeated until all of the subsamples do not reject the null hypothesis. This procedure can over- or under-estimate the true location of the break date. Bai (1997) therefore recommends a repartitioning procedure, whereby each identified breakpoint is re-estimated separately in the data segment defined by the preceding break (or the first observation in the full sample) and the subsequent shift (or the final observation in the full sample).. The minimum length of a sub-sample is 15% of the sample period, or 367 observations. We search for errors at the 5% significance level.

Appendix C: Breakpoint test results dropping one Swiss city at a time

As a robustness, we drop each of the six discount rates in turn, calculate the RMSD of the remaining five rates and search for breaks in the RMSD, using the same test as in Appendix B. The results are presented in Table C1. The break date in 1881 is identified in all cases with the exception of when the data for Lausanne are dropped. Then the break date is identified in late 1879. We expect some variation in the exact date of the break, but would be particularly concerned if several breaks occurred after the Banknote Act in 1881. In contrast, breaks in advance of the Act (such as that identified when Lausanne is dropped) would suggest some anticipation effect which, in light of the discussion in Sections 2 and 6, would be expected. Moreover, this final break in 1881 is identified in all cases, whereas, in the case that Zurich is dropped, earlier breaks are not observed.

Table C1: Identified break dates in mean of the RMSD, dropping one Swiss city at a time, 1846M1-1893M6

Excluding Basel	Excluding Bern.	Excluding Geneva	Excluding Lausanne	Excluding St. Gallen	Excluding Zurich
8/6/1854	4/8/1853	28/12/1854	4/8/1853	4/8/1853	
10/9/1863		10/9/1863	5/11/1863	10/9/1863	
	26/3/1874		3/8/1871	26/3/1874	
14/4/1881	14/4/1881	14/4/1881	16/10/1879	14/4/1881	14/4/1881

Note: Break dates are the beginning of the subsequent sample period.

Appendix D: Table of main accords and important events related to banknote conversion

Date	Involved parties	Details	Source
11 Mar 1844	Bank in Zürich, Bank in St. Gallen	Emergency liquidity provision. Still no conversion of banknotes	Bleuler, (1913), p. 266, Gygax, (1907), p. 29
1 Sep 1848	Bank in Zürich, Bank in Basel	Mutual acceptance, but not at par. Conversion rate arbitrarily fixed by the two banks. Charged 1/1000 for conversion. Convertible in French or Zurich currency. Agreement lasted at least until 1853	Nyborg, (2019), p. 151, Bleuler, (1913), p. 267, Eidgenössische Zeitung
1850	Berner Kantonalbank (BEKB), Banque Cantonale Vaudoise (BCV), Banque de Genève, Banque Cantonal de Fribourg	Annual report mentions an accord for mutual banknote conversion	BEKB (1851), p. 5
1852	Bank in Zürich, Bank in Basel	Conversion of new banknotes but not at par (adaption of old agreement)	Ernst (1904), p. 48
22 Dec 1852	Bank in Basel, Bank in St. Gallen	Mutual acceptance. Charged 1/1000	Gygax, (1907), p. 218

Date	Involved parties	Details	Source
1852	Bank in St. Gallen, with local banks "Nebenplätze": Glarus, Thurgau, later Solothurn, Aarau, Schaffhausen	Conversion of banknotes at par	Gygax (1907)
7 Jan 1853	BCV, Bank in St. Gallen	Conversion of banknotes. BCV has now the same accord with the Bank in St. Gallen as with BEKB and Banque de Genève, Banque Cantonal de Fribourg	Nouvelliste Vaudios
4 Feb 1853	Glarus	Negotiations with Bank in Zürich for conversion at par fail	Neue Zürcher Zeitung
1 Dec 1853	BEKB, BCV, Banque Cantonal de Fribourg	Agreement to convert banknotes at par fail. BEKB introduces fees (1/4 percent below 500 and 1/8 percent above 500 for BCV and BCF) and twice as much for Bank in Basel, Bank in St. Gallen, Bank in Zürich	Eidgenössische Zeitung, Nouvelliste Vaudois, Intelligenzblatt Bern
1856	Bank in Basel, Aargauische Bank	Mutual acceptance. Charged 1/1000	Nyborg (2019), p. 153, Ernst (1904), p. 48
1857	Bank in Zürich, Aargauische Bank	Usually conversion at par	Nyborg (2019), p. 153

Date	Involved parties	Details	Source
8 Sep 1858	Local banks "Nebenplätze": Solothurn, Aargau, Glarus, Thurgau	Conversion at par	Eidgenössische Zeitung, Nyborg (2019), p. 153-154
15 Jun 1859	Bank in Zürich, Bank in Basel	Reduction of conversion charges to 0.5/1000	Bleuler, (1913), p. 268, Eidgenössische Zeitung
2 Feb 1859	BEKB, BCV, Banque Cantonal de Fribourg, Aargau, Neuchâtel, Solothurn	Charges 1/1000 for conversion of notes and 2/1000 for other banks	Thuner Wochenblatt
1 Sep 1862	BEKB, Geneva	Conversion at par. Not fully clear whether Banque du Commerce de Genève or Banque de Genève. BEKB made same offer to other banks	Nyborg (2019), p. 154-155, Debes, (1907), p. 97
1863	Eidgenössiche Bank Bern	Foundation of a bank with aspirations to branch to various cantons and become the main banknote issuer	Meyer, (1903), p. 47
19 Sep 1864	Bank in Basel, Bank in St. Gallen, Bank in Zürich	Conversion at par, notes above 50 CHF ("Alte Konkordatsbanken"). Equally share costs of metal shipments	St. Galler Zeitung, Gygax, (1907), p. 196, Ernst (1904), p. 48
Dec 1864	Seven "Nebenplätze"	Letter to Bank in Basel, Bank in St. Gallen, Bank in Zürich to join or to dissolve the Konkordat	Nyborg, (2019), p. 158

Date	Involved parties	Details	Source
Dec 1864	"Nebenplätze": Luzern, Glarus, Eidgenössische Bank, Aargau, Solothurn, Thurgau, Toggenburg, Schaffhausen	Notes of Bank in Basel, Bank in St. Gallen, Bank in Zürich converted only charging 1/1000. Response to accord of the "Alte Konkordatsbanken" Some exceptions because of existing bilateral accords. Own notes conversion at par	Der Bund
1 Jul 1865	"Nebenplätze" Aargau, Thurgau, Solothurn, Schaffhausen, Toggenburg	Conversion at par in Zurich at C.W. Schläpfer	Neue Zürcher Zeitung
25 Aug 1865	Bank in St. Gallen	Bank in St. Gallen refuses to accept notes of Eidgenössiche Bank, who started to branch in various areas in Swtizerland	Gygax, (1907), p. 217
Nov 1865	Bank in St. Gallen, Banque du Commerce de Genève	Contract with similar terms as with Bank in Basel	Bleuler, (1913), p. 274
Dec 1865	Bank in Basel, Bank in St. Gallen, Banque du Commerce de Genève	Contract with similar conditions as with Bank in Basel and Bank in Zürich ("Alte Konkordatsbanken"). According to Nyborg, Banque du Commerce joins the Konkordat. But Meyer talks about bilateral accords	Gygax, (1907), p. 196, Nyborg, (2019), p. 157, Meyer, (1903), p. 156

Date	Involved parties	Details	Source
1865-1867	Bank in Basel, Bank in St. Gallen, Bank in Zürich	Negotiations to issue common banknote. Did not succeed	Bleuler, (1913), p. 278
31 Mar 1867	"Nebenplätze": Graubünden, Toggenburg, Thurgau, Aargau, Luzern	Conversion at par	Der Bund, Intelligenzblatt Bern
10 Sep 1867	Bank in Basel, BEKB	Conversion of banknotes at par. According to Nyborg, BEKB joins the Konkordat	Thuner Wochenblatt Nyborg, (2019), p. 157
Feb 1870	Eidgenössische Bank	Suspends convertibility of notes of other banks.	Der Bund
19 Jul 1870	Bank in Zürich	Announces that it retains the right to not convert banknotes from other banks despite agreements.	Gygax, (1907), p. 170
Jul 1870	Most Emissionsbanks	Refuse to pay cash because impossible to discount bills of exchange in France or Germany	Nyborg, (2019), p. 168, Jöhr (1915)
30 Jul 1870	Confederation	Foreign coins become legal tender (temporarily): English Sovereign, Reichsgulden, Austrian Gulden, Prussian Thaler. Not fully clear. Bundesblatt mentions only the English Sovereign	Nyborg, (2019), p. 170

Date	Involved parties	Details	Source
1870	Bank in St. Gallen	Discussions about common liquidity provision ("Garantieverband"). But these negotiations fail.	Gygax, (1907), p. 175
1870	Confederation	Project to establish a "Schweizerischer Bankverein" with uniform "Vereinsbanknoten", that may possibly obtain legal tender status. But these negotiations fail.	Gygax, (1907), p. 178
1870	BEKB	Proposal to convert banknotes at par, and that they become legal tender. Bank in St. Gallen opposes the proposal.	Gygax, (1907), p. 173
1 Jan 1871	BCV, BEKB	Conversion of banknotes at par	Nyborg, (2019), p. 155
12 May 1872	Confederation	Revision of constitution that would give confederation power to regulate banknote issuance rejected by popular vote	Ernst (1904), p. 65
1872	Bank in St. Gallen, Bank in Zürich, Bank in Basel, Banque du Commerce de Genève	Discussions about issuing common banknote. Goal was to increase circulation and replace notes of smaller institutes. In the end also involved BEKB.	Gygax, (1907), p.221

Date	Involved parties	Details	Source
10 May 1872	BEKB, Banque du Commerce de Genève	Conversion at par 50 CHF and above. Restrictions apply for large amounts	Intelligenzblatt Bern, Intelligenzblatt Bern
9 Dec 1872	Bank in Zürich, BEKB	Similar conditions for conversion as with Bank in Basel and Bank in St. Gallen. Glarus and Aargau join in the same year	Bleuler, (1913), p. 274, Gygax, (1907), p. 198
Dec 1872	BCV, Banque du Commerce de Genève	Similar conditions for conversion as BEKB and BCV, conversion at par	Nyborg, (2019), p. 155
17 Jun 1873	Bank in St. Gallen	Bank in St. Gallen refuses to convert "wild" banknotes. These were notes that could not be converted in the canton St. Gallen itself	Gygax, (1907), p. 216
25 Jun 1873	BEKB, Bank in Basel, Bank in Zürich, Bank in St. Gallen, Banque du Commerce de Genève, BCV, Aargauische Bank, Banque Cantonale Neuchâteloise (BCN)	Conversion banknotes at par of denominations of 50 CHF and larger. Not fully clear whether this is a new accord or information for the public	Tagblatt Stadt Biel
1 Jul 1873	BCN, BEKB	Conversion banknotes at par (only at main office, facultative at branches)	FAN

Date	Involved parties	Details	Source
15 Oct 1873	BEKB, BCN	Agreement failed. Charge 1/1000 for conversion	Tagblatt der Stadt Biel
1 Dec 1873	BEKB, Bank in Basel, Bank in St. Gallen, Bank in Zürich	Issuance of common banknote 1000 CHF denomination (agreed in 1873), the so-called "Vereinsnote"	Bleuler, (1913), p. 278, Nyborg, (2019), p. 188
29 May 1874		Revised constitution gives Confederation the right to legislate banknote issuance and conversion. Monopoly or banknote as legal tender explicitly ruled out. Vote was on 19 April 1874. However, no legislation was passed until 1881	Jöhr (1915), p. 501, Ernst (1904), p. 69
16 Jun 1874		Dispatch (comment) on the first banknote act	Gygax, (1907), p. 222, Jöhr (1915), p. 501
1875	BCV, Solothurn, Aargauische Bank	Conversion at par	Nyborg, (2019), p. 155
1874-1876	Bank in Basel, BEKB	Adapt their banknotes in response to the upcoming banknote act (which failed in a referendum later on)	Nyborg, (2019), p. 188
23 Apr 1876		Failure of first banknote act	Bleuler, (1913)p. 279, Jöhr (1915), p. 501, Ernst (1904), p. 78

Date	Involved parties	Details	Source
24 Mar 1876	Glarus	Refuses to accept presumably fake banknotes. Finance administration of the canton therefore suspended acceptance of banknotes from the Bank in Glarus	Zürcherische Freitagszeitung
1 Sep 1876	BEBK, Bank in Basel, Bank in St. Gallen, Bank in Zürich	"Erstes Konkordat". Conversion at par if sufficient currency and as long as note issuing bank honours obligations. Below 50 CHF immediate conversion at par. Notes 50 CHF and larger delay of 3 days possible. Exchange of information between banks, but not publicly	Gygax (1907), p. 227, Der Bund, Jöhr (1915), p. 501, Nyborg (2019), p. 1972
1 Sep 1876	21 banks	"Erstes Konkordat". Extended to other banks. Now covers 2/3 of all emission banks. Also, with transparency rules and information exchange (weekly). The first clearing house ("Zentralstelle") at the Bank in Zürich starts operating	Bleuler (1913), p. 279, Neue Zürcher Zeitung (list of all banks), Gygax (1907), p. 94., Nyborg (2019), p. 190

Date	Involved parties	Details	Source
7 Sep 1876	Finance Department	Notes of the Konkordat are accepted for public services, although not legal tender (federal taxes, post, telegraph, tariffs). Letter to the various actors sent on 31 August 1876. "Kassenkurs"	Neue Zürcher Zeitung, Nyborg (2019), p. 191
3 Dec 1877	Federal Council	Federal council decides that a law in Zurich, which would give a monopoly on banknote issuance to the Cantonal Bank of Zurich, is unconstitutional	Ernst (1904), p. 89
1 Jul 1878	Cantonal Bank of St. Gallen	Joins Konkordat	Nyborg (2019), p. 196
1 Mar 1879	24 banks	"Erstes Konkordat". Clearing only at note issuing bank. Central clearing not possible anymore. Risk for the "Zentralstelle" (Bank in Zürich) was too large	Bleuler (1913), p. 281, Gygax (1907), p. 211, Nyborg (2019), p. 202
31 Oct 1880	Confederation	Attempt (popular initiative) to revise the federal constitution to give Confederation the banknote monopoly fails (rejected by a popular vote)	Ernst (1904), p. 99
8 Mar 1881	All note issuing banks	Banknote act (vote passed)	Bleuler (1913), p. 282, Bundesgesetz über die Ausgabe von Banknoten

Date	Involved parties	Details	Source
1 Jul 1882	All note issuing banks	Banknote act takes effect. Conversion at par, among financial stability and transparency rules. Somewhat unclear whether 1881 or 1882. Different sources disagree. More likely 1882 because the "Vollziehungsverordnug" (ordinance) passed only in December 1881. And Meyer, 1903, p. 100, talks about a 6 month delay for banks to adapt themselves	Bleuler (1913), p. 282, Gygax (1907), p. 241, Jöhr (1915), p. 501
1 Jul 1882	19 banks	"Zweites Konkordat". Was mostly about clearing ("Zentralstelle der Konkordatsbanken") because note conversion and capital requirements were determined by banknote act	Bleuler (1913), p. 282
24 Jul 1882	All note issuing banks	Aggregate weekly results of Emissionsbanken published in NZZ (before only aggregate results of the Konkordatsbanken)	e-newspaperarchives.ch
Jul 1882	All note issuing banks	Individual weekly results of Emissionsbanken published in Finanz- and Zollanzeiger	Nyborg (2019), p. 220. Exact date unknown

Date	Involved parties	Details	Source
6 Jan 1883	All note issuing banks	Individual weekly results of Emissionsbanken published in SHAB for first time	SHAB
1 Jul 1887		ZKB (Cantonal Bank of Zurich) takes over clearing house function from Bank in Zürich. Bank in Zürich did not have the means to act as a profitable clearing house	Bleuler (1913), p. 292
18 Oct 1891	Confederation	Revision of constitution giving the confederation the banknote monopoly passes (two options possible: state bank or private stock company)	Ernst (1904), p. 164
1 Jul 1893	28 banks (Emissionsbanken)	Common discount policy (discount committee of the Emissionsbanken). Official discount rate for very short maturites almost irrelevant. Private rate more relevant	Gygax (1907), p. 283
9 Jun 1894	28 banks (Emissionsbanknen)	Emissionbanks agree to not discount below a minmum discount rate ("private rate"). They regularly discounted below the official rate	Jöhr (1915), p. 502

Notes: Important agreements and legislation regarding banknote conversion. This is based on a literature review and search of newspapers. Therefore, the list may miss some (less important) agreements.