

Austria

Clemens Jobst, University of Vienna and Central Bank of the Republic of Austria¹

Contemporary credit and financial statistics for Austria can be accessed on the websites of the Central Bank of the Republic of Austria (Oesterreichische Nationalbank, OeNB) and the ECB Statistical Data Warehouse. Typically, they start in the 1980s or 1990s and follow standards set by Eurostat and the ECB. Some data for earlier years exist at the national bank but most of these are available in print only.

Until recently, the most comprehensive set of historical monetary and financial data available was Butschek (1999). Providing also a large number of real economic indicators, Butschek reproduced tables from contemporary statistical publications without, however, providing documentation or harmonising data across sources. The focus of this collection was on the territory of the Republic of Austria, but for the years before 1918 many of the series provided in contemporary publications referred in fact either to the entire Dual Monarchy or to its Austrian half which, in any case, was much larger than the Austrian Republic today. As a result, these data lack consistency and comparability.

In preparation for the OeNB's bicentennial in 2016, efforts were undertaken to extend existing series back in time as well as to build new series with the aim of creating the consistent long-term data necessary to understand Austrian monetary history (Jobst and Kernbauer (2016)). The attitude of the authors was aligned with the principles outlined in the present paper. A forthcoming working paper (Jobst (forthcoming)) provides detailed documentation of these data including credit and interest rates. Long-run housing prices are available from Lampe et al (forthcoming).

The following chapter provides a brief sketch of the relevant territorial developments of Austria since the creation of its central bank in 1816, before moving on to describe the existing series, and suggesting how they can be improved as well as identifying sources that could be mobilised to achieve that goal.

Territory

In its current borders, Austria, officially the Republic of Austria (Republik Österreich), dates back to 1921. It is the outcome of the state formation processes that occurred after the end of World War I. For centuries before, its territory had formed an integral part of the Habsburg Empire, accounting for roughly a sixth of its surface and population in 1918 (Graph 1). Territorial changes throughout the 19th century as well as changes in the constitutional setup raise questions both on the geographical scope of macro-financial data as well as on the historical processes that have generated these. The first section will look at the impact this has on interest and credit series.

¹ Clemens Jobst is Professor of Economic and Social History at the University of Vienna, a CEPR Research Fellow, and serves as academic advisor to the Austrian central bank. All views expressed here are his own and do not necessarily reflect those of the Central Bank of the Republic of Austria or the Eurosystem.

To cope with the significant break brought about by the dismemberment of the Austro-Hungarian Monarchy in 1918, some historians have attempted to construct retrospective statistical series for Austria *within its current borders*. Such an approach is helped by the fact that the *Länder*, which make up Austria today, largely correspond to historical provinces. Conveniently, in the past these were used as a unit of analysis in the collection and reporting of statistical data. Following this logic, time series for the territory of present-day Austria have been extended backwards before 1918, notably for population, agricultural and industrial production, GDP and consumer prices.²

Map of Austria-Hungary in the borders of 1914 and 1920

Figure 1



Source: https://en.wikipedia.org/wiki/Austria-Hungary#/media/File:Dissolution_of_Austria-Hungary.png.

As regards financial and monetary data, however, it is doubtful that this approach, probably unfeasible in practice, makes any sense analytically. In terms of monetary integration, it can be argued plausibly that, after the end of the Napoleonic Wars, the Empire constituted an increasingly unified area. Unlike other contemporary central banks such as the Bank of England or the Bank of France, whose note-issuing monopoly was restricted to the capital region before gradually extending throughout the realm, the Austrian National Bank held *from its foundation* in 1816 a de facto monopoly for the Empire's entire territory. Local "exchange offices", operated by the Bank in the provincial capitals, supported the circulation of banknotes (Jobst and Kernbauer (2016)). By standing ready to convert banknotes against specie, they ensured the spatial stability of their value in terms of the legal tender, a silver coin.³

The situation is more complex for *money markets*. Vienna was certainly the seat of the most important private banks operating across the Empire and this made Vienna the central money market. But Vienna was not the only financial hub: money markets operated in Trieste, Venice and Milan (then part of the Monarchy), dealing,

² See eg the various contributions to *Österreichisches Statistisches Zentralamt* (1979).

³ Though with the exception of Venetia and Lombardy, recently acquired in the Treaty of Vienna. Venetia and Lombardy had their own silver currency, the *lira austriaca*, which was, however, tightly linked to the Austrian florin.

among others, in short-term credit instruments payable in Vienna as well as in the other Austro-Italian cities. In fact, the presence of the offices of the national bank did not fully eliminate fluctuations in the (domestic) exchange rates between these individual markets. Domestic exchange rates would disappear only in the second half of the 19th century, when the central bank started offering inter-regional clearing services.⁴ Hence, at least during the first half of the 19th century, regional money markets were not fully integrated with one another.

For *long-term yields* the chronology seems reversed, as Austria moved from a unitary state to becoming the dual monarchy.⁵ In 1867, the so-called Compromise granted significant political and financial autonomy to the Lands of the Hungarian Crown.⁶ The Empire, now informally labelled "Austria-Hungary", henceforth consisted of two entities enjoying fiscal sovereignty: Hungary (Transleithania) and Austria (Cisleithania), as depicted in Graph 1. There was a central government, responsible notably for the military. But it was financed out of the budgets of the two member states and did not issue its own debt, which could serve as benchmark. So the borrowing entities were not just one but two, Austria and Hungary, and both were priced by financial markets, up to a point as if they had been independent states (Flandreau (2006)). This has to be kept in mind when looking for "the" long-term yield for the Habsburg Empire, while not forgetting that the Austrian economy was about twice the size of the Hungarian, and also hosted the main capital market etc, thus giving Austrian yields a certain prominence. In practice, until World War I, Hungarian yields would never go below the Austrian "benchmark".

Territory, arguably, matters most for *credit*, where changes in the area covered have a direct consequence on aggregate numbers. Three events have to be mentioned for the 19th century: the loss of Lombardy and Venetia in 1859 and 1866 respectively, and the annexation of Bosnia-Herzegovina in 1878. Bosnia-Herzegovina had a relatively small population and an even smaller weight in economic terms, thus hardly affecting the macro-financial series. But Venetia and in particular Lombardy were among the Empire's economically highest developed regions, featuring stock exchanges, as well as numerous banks, savings institutions and industries. Their loss therefore creates significant discontinuity in credit data. De facto, however, information on credit for the period for the decades before the 1860s is very limited anyway, thus making the issue less relevant at this stage. It might become an open question if future research does tackle these years.

The composite nature of the Empire and the political changes just described also had a bearing on the *collection of credit data*. Testifying to the increasing integration of the Habsburg monarchy, a central statistical office was set up in 1829, regularly gathering and publishing statistical information on the Empire (Zeller (1979)). Yet at least until the mid-19th century the quantity and quality of the data collected varied between the historic components of the Empire, ranging from ample evidence for the Alpine and Bohemian lands to more fragmentary records regarding Galicia or the lands of the Hungarian Crown. In addition, statistical publications kept separate

⁴ By the last decades of the 19th century, when Budapest and Prague rose alongside Vienna to become important regional financial centres, money markets within the Empire were perfectly integrated: the financial press never reported specific rates for Prague or Budapest – apparently the prices established in Vienna applied to the entire monarchy.

⁵ For a discussion of these points in a modern context, see Flandreau (2003).

⁶ In addition to Hungary today, the Lands of the Hungarian crown included parts of Slovenia and Croatia, Serbia, Slovakia and Transylvania, today Romania.

entries for the Kingdom of Lombardo-Venetia and often data for the different provinces were collected in different formats. Following the 1867 Compromise, Hungary built up a separate statistical infrastructure and started to publish its own statistics, which in scope and definitions often deviated from the standard used in statistics provided by its Austrian counterpart. Bosnia-Herzegovina, occupied in 1878 and jointly administered by Austria and Hungary, featured in neither the Austrian nor the Hungarian statistics. As a result, much of the literature on the banking and financial history of the Empire treats either Austria or Hungary, but rarely both.

The situation was greatly “simplified” in 1918. From now on harmonised statistical data were collected by a single statistical office responsible for the entire territory of the newly founded Republic of Austria. But another break was brought about when Austria was occupied by Nazi Germany in March 1938. From 1939 onwards barely any data were published for the territory of the Republic, even more so as the new rulers strove to efface any reference to the former Austria. Finally, from 1945 onwards the area of statistical data collection again corresponds to the territory of Austria.

Credit

Today, data on bank credit are published as part of the data set on balance sheet items (BSI) of monetary financial institutions (MFI).⁷ The series are homogeneous across the Eurosystem, start in 1997 and are available via the ECB Statistical Data Warehouse (SDW). The adoption of ECB criteria marks a break with previous national statistics for credit institutions. The Austrian National Bank started to publish monthly aggregate balance sheets in 1953. It also provided a breakdown according to the different sectors within the banking system (joint-stock banks, private banks, savings banks, credit cooperatives, Landesbanken etc). Data collection was then based on the reporting requirements laid down in the German Kreditwesengesetz of 1934, which was implemented in Austria after the country’s annexation by the Reich in 1938. It was kept in place after Austria regained its independence in 1945 (Lucius (1983)). Printed tables can be found in the monthly and annual reports of the OeNB. For easier access, the balance sheet items relating to credit have been collected and documented in Jobst (forthcoming).

Until the adoption of the Kreditwesengesetz, Austrian credit institutions had been subjected to fairly light regulation, resulting in no standardised or comprehensive reporting requirements. Reporting rules varied widely between different banks. The central bank was subjected to strict disclosure, owing to a law in 1863 stipulating the publication of annual balance sheets as well as weekly figures. In fact, the Bank had already done so voluntarily since 1848 (Jobst and Kernbauer (2016)). Likewise, savings banks, of which the first was founded in 1819, were governed by a special legal statute that mandated annual reporting of the balance sheet to the Ministry of Finance (Fritz (1972)). A similar statute for credit cooperatives was passed in 1873.

⁷ Complementary information on new loans granted (flows) is collected as part of the Eurosystem’s MFI Interest Rate (MRI) Statistics, equally available via the SDW.

The first joint-stock bank was founded in 1853 and the sector expanded rapidly during the Gründerzeit boom of 1867–73 (März (1973)).⁸ Joint-stock banks, however, were not subject to any specific legal regime (Bráf (1905)). Operating within the general commercial code, these banks published balance sheets as part of their annual reports to shareholders, but there were no rules which would have harmonised accounting and reporting practices. The Austrian statistical office duly collected the publicly available balance sheets and published both bank-level data and aggregate numbers, even though the individual data were not, and could not be, harmonised.⁹ The quality of balance sheet data appears to be better for the Kingdom of Hungary, where until the dissolution of the Dual Monarchy the statistical office operated with standardised questionnaires for all types of banking institution, including savings and joint-stock banks. However, Hungary applied categories and definitions that were different to those of Austria, creating a challenge for the construction of *aggregate* series for Austria-Hungary.

The numerous private banks organised as single proprietorships or partnerships published no balance sheets at all. This leaves out an important share of the banking sector, as private banks long dominated banking and continued to play an important role even after the rise of joint-stock banks in the 1860s and at least until the 1900s, when the Vienna, Prague and Budapest-based joint-stock banks started to branch out into the provinces, integrating local private banks into their networks (Eigner (2018), Michel (1976)). While it is unclear how the lending volume of these banks could ever be reconstructed, at least some information on the number of private banks can be derived from address books and firm registers. This way, it is known for instance that at the end of 1918 the Republic of Austria counted 27 joint stock banks and upward of 200 private banks. For 1921, balance sheet totals were collected by a parliamentary enquiry. At that time, the 25 largest private banks had a balance sheet total of 104 billion crowns, against 400 billion for the 25 largest joint-stock banks (Resch (2018)). Due to the preceding war and high inflation, such figures have to be viewed with caution and are, for instance, not necessarily representative for the situation before 1914. Still, the size of the private bank sector offers an egregious case of “dark matter” and this calls for more quantitative research.

To sum up, the availability and quality of information before 1938 or 1953 thus depends on the sector we are looking at. The situation for the central bank is excellent and that for savings banks is reasonably good. Information on credit cooperatives comes largely from federations and is fragmentary (K.k. statistische Zentralkommission (1901)). Data on joint stock banks are fairly complete, although not harmonised. No data are available for private banks in either Austria or Hungary. The picture is even worse for the interwar period, when hyperinflation and a sharp increase and a subsequent fall in the number of banks combined with limited resources in the statistical office make for less detailed and lower-quality official

⁸ The central bank, founded in 1816, was also organised as joint-stock company but operated under a special statute.

⁹ Starting with the foundation of the first joint-stock bank in 1853 and until the early 1870s, individual bank data were featured in the statistical yearbook. As the number of banks grew, the yearbook switched to aggregate tables, while bank level data were reported in dedicated issues of the *Österreichische Statistik* from 1882 onwards.

statistics. The publication of special statistics for banking ceased altogether and only aggregate information is available from the *Statistische Handbuch*.¹⁰

Non-bank credit surely played a central role before the advent of commercial and saving banks, credit cooperatives and other institutions in the second half of the 19th century, but information is difficult to come by. Short-term credit through commercial bills was subject to a stamp duty, but stamps were used for a variety of purposes and the volume of commercial bills cannot be backed out as it has been done eg for France, England or Germany. Non-bank credit certainly played an important role for long-term borrowing as well. Until the mid-19th century, mortgages were provided primarily by foundations, a handful of public institutions investing funds on behalf of orphans, and private investors (Bráf (1899)). Information on all these is again limited. Savings banks and specialised mortgage-lending institutions rose to importance in the second half of the 19th century. While certainly providing fresh funds, part of their lending served to refinance existing debts to non-bank creditors. In fact, the lowering of interest rates on *existing* debt was the main purpose of many of the Landesbanken, mortgage lending institutions sponsored by the provincial governments, most of them founded between 1890 and 1914. Still, as late as 1903 the statistical office estimated that a third of the total mortgage lending in Austria (excluding Hungary) was provided by non-banks (Oppenried (1907)), implying that this share must have been significantly higher in previous decades. Future research could use information from the land registers to obtain similar estimates for earlier years too.

Interest rates

Government bond yields

Yields on 10-year benchmark bonds are available from Eurostat starting in 1985. The initial purpose of the series was to check conformity with the Maastricht convergence criterion for long-term interest rates. Selection guidelines require data to be based on central government bond yields on the secondary market, gross of tax, with a residual maturity of around 10 years. The bond in the basket is replaced regularly to avoid a larger maturity drift. Starting with September 2004, yields on other maturities along the yield curve are stored in the ECB SDW, but are currently only available for internal use in the Eurosystem.

For the years before 1985, researchers can use the secondary market yield (Sekundärmarktrendite SMR) calculated by the Oesterreichische Kontrollbank (OeKB). Unlike the 10-year benchmark, this series refers to a volume-weighted average yield of all outstanding government bonds with a remaining maturity of at least one year. As a result, the SMR is influenced by changes in the slope of the yield curve and the maturity composition of the government debt stock. Due to an outdated methodology and the low liquidity of off-the-run bonds, the publication of the SMR was discontinued in 2015.¹¹ The historical SMR series starts in January 1980 and is

¹⁰ Researchers interested in information on individual joint-stock banks during the interwar period can, however, resort to the privately published financial handbook *Compass*. The *Compass* collected public information on corporations and appeared continuously, starting in 1868.

¹¹ For legal purposes the SMR was replaced by the “average government bond yield weighted by outstanding amounts” (UDRB). For details of the calculation see: www.oenb.at/en/Statistics/Standardized-Tables/interest-rates-and-exchange-rates/austrian-government-bond-yields/udrb-information-on-the-method-of-calculation-.html (accessed 22 April 2022).

available from the OeNB. The SMR continued an earlier index calculated by the Länderbank, a Vienna-based commercial bank. The Länderbank index seems to be an average yield like the SMR, but there is little documentation available. For the Länderbank index, monthly values go back to 1970 and annual values to 1965. Both series are reproduced in Jobst (forthcoming).¹²

For the 1945–65 period, neither benchmark yields nor composite indicators are currently available. While Austria issued a first bond in 1949 with quotes becoming available from the Vienna stock exchange in 1950, the transformation of the raw prices into continuous series for bond yields poses significant challenges as raw yields for apparently similar bonds are widely dispersed in the cross section. This calls for further research into the details of the bonds as well as taxation, regulation and market structures that might explain the idiosyncratic behaviour of the different debt titles.

The situation is not much better for the interwar years, if for different reasons. As explained in Box II.2 in Flandreau and Jobst (2022), a significant part of Austrian debt in this period was guaranteed by foreign governments. In addition, with capital controls imposed in 1931 and the US dollar leaving the gold standard, the exact meaning of the various foreign currency clauses was in limbo. As a result, prices of bonds reflected mainly political and legal risks as well as idiosyncratic features rather than broader refinancing conditions for the government and the Austrian economy at large. For selected series and a more detailed discussion see again Jobst (forthcoming).

The availability and quality of long-term yields is much better for the *period before 1914*. Data on bond prices became routinely available with the foundation of the Vienna stock exchange in 1771. For the 19th century, even though some part of Austrian government debt was held and traded abroad, Vienna constituted an important and active market. For most years, researchers can rely on a small number of benchmark perpetual bonds with fairly straightforward characteristics. Still, there are a number of specific aspects to consider when selecting bonds and calculating yields.

First, attention has to be paid to *changes in the monetary standard*. In the 19th century, Austria, and later Hungary as well, issued mainly in domestic currency, sometimes with, or sometimes without clauses stipulating payment in effective coin.¹³ Several changes in the monetary standard mean that bonds with several different denominations were in circulation, at times in parallel. Following the monetary turmoil of the Napoleonic Wars, Austria re-established a silver standard in 1816. Bonds were issued in silver florin but did not carry an explicit silver clause. When the government suspended the convertibility of the florin into silver coin in 1848, it also switched its debt service to (depreciated and fluctuating) paper money. Some of the new debts, issued after 1848, however, now included an explicit silver clause. Thus, two

¹² There are no yields for May to July 1974, when the government contemplated a voluntary increase in the coupon. By raising nominal returns, the government wanted to support the price of government debt in the face of increasing inflation and prevent capital losses for banks and other institutional investors (Kernbauer (2018) p 124). Due to the related uncertainty, the Länderbank temporarily stopped the calculation of yields. The law was finally passed in July 1974, and the publication of yields was resumed.

¹³ Austria also issued bonds with foreign currency clauses referring to eg sterling, later also to francs and marks, but these issues were typically smaller, less liquid and are not considered here. Austria was, however, also able to circulate bonds denominated in florins abroad.

benchmark yields become available: one for paper and one for silver-denominated debt. Austria's currency remained inconvertible until 1878, when due to the decline of the silver price in international markets, the premium on silver coin disappeared. Austria and Hungary stopped the minting of new silver coins and de facto decoupled the florin from silver. For financial markets, this meant that the difference in prices between silver and paper bonds disappeared. In 1876, Austria, followed a year later by Hungary, started to issue a third type of debt, perpetuities denominated in gold.¹⁴ In 1892, Austria-Hungary adopted a gold standard legislation and introduced the gold crown, defined at 2 K = 1 fl. Although formally convertibility was never established, from 1896 onwards regular interventions by the central bank ensured that the exchange rate of the crown fluctuated in a tight range with gold currencies such as sterling, the franc and the mark (Jobst (2009)). For the period 1876–1914 thus again two types of benchmark are available, paper and gold. Table 1 summarises the history of the legal and de facto monetary standard and the available bond prices for the 19th century.

Monetary standards and currency denomination of bonds, 1816–1914 Table 1

Period	Standard	Legal tender	Currency clauses in benchmark bonds
1816–1848	Silver (fl. C.M.)	Silver	(Silver) florin
1848–1858	Silver (fl. C.M.)	Paper	Paper florin, silver florin
1858–1878	Silver (fl. ö.W.)	Paper	Paper florin, silver florin, gold florin/FF (from 1876)
1878–1893/1900	Silver (fl. ö.W.), but minting of silver suspended	Paper	Paper florin/crown, gold florin/FF, (silver florin effectively identical to paper)
1893/1900–1914	Gold (K)	Paper (with stable exchange rate to gold)	Paper crown, gold florin, (silver florin effectively identical to paper)

A second issue to consider is *taxes and defaults*. Austria repeatedly levied new or increased existing taxes on coupons, which changed the ex post return for investors. In cases where the tax applied to the entire bond issue and was withheld at the source, the tax was equivalent to a reduction in the coupon and could thus be considered a partial default. The most notable case is the 16% tax introduced in 1868 which lowered the coupon from a nominal 5% to de facto 4.2%. To reassure investors, bond issues after 1878 were declared tax-free.

A third issue is *conversion risk*. Most bonds used in Jobst (forthcoming) are perpetuities. In every case, however, the government reserved the right to redeem the bonds at par. As discussed in Flandreau and Jobst (2022), this redemption option could significantly affect prices. In the century between 1816 and 1914, three periods have to be mentioned. In the 1830s and the late 1890s, there was finally no large-scale conversion of existing debt as rising interest rates soon made such an operation infeasible. However, on both occasions markets were certainly influenced by the possibility that a conversion could take place. A successful conversion took place in

¹⁴ Bonds were denominated in gold florins. To prepare for a possible membership in the Latin Monetary Union, Austria had started in 1870 to mint an eight-florin coin (in terms of weight and fineness equal to the French 20 franc gold coin). In the end, however, Austria did not join and the gold florin remained a trading coin with a fluctuating market price in terms of the legal tender florin.

1893, when interest on the 5% Austrian paper bond was lowered to 4%. Fortunately, for this episode an alternative series not affected by conversion risk is available.

The last issue is the *identity of the sovereign borrower*. As already mentioned above, the Empire of Austria was reorganised as a dual monarchy in 1867. Hungary acquired fiscal autonomy, while the debts of the old central government were de facto taken over by the Austrian half of the Empire.¹⁵ From then on, Austria and Hungary each issued their own debt. Comparability is helped by the fact that both countries aligned the structuring of their debt, issuing paper and gold debt carrying the same nominal interest rates (Flandreau (2003)). Yet financial markets priced the two countries differently and for the years 1867–1914 we thus have both Austrian and Hungarian benchmark yields.

To sum up and keeping the caveats just mentioned in mind, consistent long-term government yields can be calculated for most years between 1816 and 1914. There follows a long period with limited information stretching from 1918 to the mid-1960s. The Bretton-Woods period is here a promising area for future research. Standard 10-year yields become available from 1985 onwards.

Alternative long-term rates

Alternative long-term yields could be obtained from covered bonds and other non-government bonds traded at the Vienna stock exchange. As in Germany, Austrian covered bonds were very low risk due to the double protection offered by the issuer and a dedicated cover pool. Covered bonds could therefore be useful to track trends in low-risk assets during periods when the market for government bonds was disturbed or no government bonds are available. The use of corporate bonds, largely used to finance the construction of the Monarchy's rail network starting in the 1840s, suffers from the fact that most railway bonds carried a government guarantee. In addition, in the decades following the 1880s many railroads were nationalised and their bonds, while still being traded at the stock exchange, were de facto converted into government debt. Non-railway corporate bonds on the other hand are rare, companies mainly financing themselves by issuing shares.

Central bank rates

Throughout its history, the OeNB's official rates refer mostly to standing facilities, where transactions are initiated not by the Bank but by its eligible counterparties. Standing facilities include notably discounting and advances (1816–1998) and the GOMEX (1985–98).¹⁶ Central bank rates are available from annual reports and retrospective publications by the central bank. The remaining section explains the operations to which these rates refer and their relation to short-term market rates.

Discount rate. At the discount facility, the central bank acquired from its counterparties securities in domestic currency with a short remaining maturity, typically three-month maximum, at a discount and held them until maturity. The

¹⁵ Hungary contributed a fixed sum to interest payments and redemption. Yields show that the "common debt" was effectively priced as if it had been the debt of the Austrian half of the Empire only.

¹⁶ GOMEX is short for Geldmarkt-Offenmarktoperationen (Open market operations in the money market) and refers to both the operations and the interest rate. The label "open market operations" is misleading as transactions were undertaken on the initiative of the Bank's counterparties, as in a standing facility.

discount rate was published by the Bank and in principle applied indiscriminately to all submissions of discountable securities. For many years, access to the discount window was not restricted to banks but open to wholesale merchants and industrial firms as well. However, scattered evidence shows that, at least by the early 1900s, the overwhelming share of the discount volume was transacted with financial counterparties (Jobst and Rieder (2023)).

Lombard rate. At the advances facility (known as *Lombard*), the Bank granted loans against the deposit of securities as well as silver and gold in coins or bars. Other than in a discount transaction, whose term was fixed by the maturity of the discounted security, the length of Lombard loans was agreed upon on a case-by-case basis up to a maximum of three months. The rate to be paid was typically 50 to 100 basis points higher than the discount rate. Again, the Bank publicly announced the rate along with a list of eligible securities, mostly fixed-income securities but occasionally also shares. In 1879, the bank began to apply a preferential lower rate to loans backed by covered bonds issued by the Bank, and later also to Austrian and Hungarian government bonds. While being more expensive, the principal advantage of advances was their flexibility. Historically, lombard loans were used mainly to bridge short-term liquidity bottlenecks, while most borrowing was done at the discount facility. The only exception to this pattern was in the 1970s, when lombard lending gained in importance. Following the introduction of the GOMEX facility in 1985 (see below) use of the lombard facility receded and again served only to cover unexpected liquidity shortages. In this function, the lombard facility was replaced by the ECB's marginal lending facility in 1999.

GOMEX rate. In GOMEX operations, the OeNB purchased securities on the initiative of its counterparties. In contrast to the lombard facility, in which the pledged security remained in the commercial bank's portfolio, ownership of securities was transferred to the OeNB in GOMEX transactions. Counterparties could repurchase the security on a daily basis. Due to the high flexibility provided by the daily maturity and the lower interest rate compared with the lombard facility, the GOMEX quickly came to dominate the refinancing of commercial banks after its introduction in 1985. Between 1985 and 1995, therefore, the interest rates in the money market moved closely around the GOMEX rate. With the introduction of weekly tenders at interest rates below the GOMEX rate in 1995, GOMEX transactions lost much of their earlier importance and were abolished with the entry into monetary union.

Rates in open market operations. In preparation for entry into monetary union, the OeNB fundamentally reorganised its refinancing operations in 1995. In line with the design of the Eurosystem's future operational framework, the OeNB introduced regular liquidity-providing open market operations, which supplied the bulk of refinancing. The tender was combined with overnight liquidity-providing and liquidity-absorbing standing facilities defining a corridor that limited the maximum range for market rates. The existing lombard facility served as marginal lending facility, while a new facility, the REGOM, served to absorb excess liquidity. The open market operations themselves were organised as fixed rate tenders.

When using historical central bank policy rates for analytical purposes, the key question is whether central bank rates were representative for market rates and thus broader refinancing conditions, and if so, which of the several rates was the most relevant. In principle, the rate on a liquidity providing standing facility acts as upper bound to movements in market interest rates (Bindseil (2004)). This is true as long as (1) the economy has an aggregate liquidity deficit (requiring the central bank's

counterparties to obtain funds from the central bank) and (2) access to the facility is not restricted (preventing market rates from overshooting the standing facility rate). Whether restrictions are in place can be analysed either by using records of the central bank on its operational procedures or by comparing market outcomes with policy rates (Bignon et al (2012), Jobst and Ugolini (2016)). Evidence for Austria suggests widespread rationing in the first half of the 19th century.¹⁷ Starting in the 1860s, rationing seems to have been gradually reduced and was probably fully abandoned by the 1880s. By then, the discount rate typically constituted the *upper limit* for market interest rates (Jobst and Rieder (2016)). The structural relationship between policy and market interest rate changed with the return to rationing in the form of refinancing ceilings after 1945. Individual ceilings limited the maximum amount banks could borrow at the discount window. Now the discount rate became a preferential rate, serving as a *lower limit* to market rates, while temporary spikes in liquidity demand had to be fulfilled at a surcharge, meaning that the market interest rate usually exceeded the discount rate. Between 1985 and 1995, the interest rates in the money market moved closely around the GOMEX rate.

Money market rates

Before the Austrian money market merged into the euro area in 1999 and EONIA and Euribor became the reference rates for overnight and term loans respectively, interbank rates were published by the OeKB as well as the central bank.¹⁸ An overnight rate, called Taggeldsatz, becomes available from the OeKB starting in November 1966. Unlike for today's short-term rates, the calculation was not based on transactions or a systematic survey of major market participants, but on OeKB's own observations of the conditions prevailing in the market, with limited information on the actual calculation procedure. In 1983, the OeNB started to publish its own Taggeldsatz. Both OeKB and OeNB rates are available until 1998 and differ slightly, though not systematically. From 1968 onwards, the OeKB also provided a three-month rate. Again, information on the methodologies used is limited. Documentation is better for the Vibor (Vienna Interbank Offered Rate) published from 1989 onwards. The Vibor was calculated for one-, three-, six- and 12-month maturities based on the 11 o'clock Reuter quotes of the eight leading Viennese banks. As in the case of Libor and Euribor, the highest and lowest rates were dropped. Three-month Vibor is on average slightly lower than the three-month rate provided by the OeKB. Given its better documentation, the Vibor is to be preferred. Between 1945 and 1966, no market rates are available.

Before the 1930s, the most important instrument for short-term lending was the bill of exchange. Despite the importance of bills of exchange for payment and the financing of trade and industry, regular reports on private discount rates do not appear in the financial press of most European markets until the middle of the 19th century. In the case of Austria, information can first be found not for Vienna but Trieste, going back to at least the 1820s. Assuming that money markets in Vienna were closely connected with those of Trieste, the main port and most important trading hub of the monarchy, this "sconto de la piazza" can be used as an indicator of the interest rates prevailing in Vienna as well. In addition, Trieste quoted both short

¹⁷ For a more detailed discussion see Jobst (forthcoming).

¹⁸ Both EONIA and the Euribor for various maturities can be downloaded from the ECB SDW as part of the FM data set. In October 2019 the EONIA was replaced as overnight rate by the euro short-term rate (EST). The EST is also available from the SDW.

and long bills on Vienna, allowing the calculation of an implicit (offshore) interest rate back to the 1820s.

For Vienna, the first, but repeatedly interrupted, data can be found for 1856. Since January 1861, the Vienna private discount rate was regularly reported in the unofficial section of the Vienna Stock Exchange's course of exchange. Interest rates published as benchmarks in contemporary publications refer to bills of exchange of the highest quality, ie bills that typically bore the signature of a leading bank or private banker. This is also reflected in the changing additions in the sources such as "erste Platzbriefe", "erstes Papier", "Bankwechsel" or "allererste Hand". Between 1861 and 1914, an interest rate for bills of exchange with a remaining term of four to six months was also quoted on the Vienna Stock Exchange under the name "Längere Sichten".

The private bill market was severely disrupted by World War I and subsequent hyperinflation. Reports for market discount rates reappear in the mid-1920s but disappear again with the failure of the Creditanstalt in 1931, when the banking sector was restructured and de facto monopolised in the 1930s. As already mentioned above, the market did not revive after World War II and market rates start to reappear in 1966 only.

Repo rates. Beginning in the 1860s, repo rates provide an alternative measure of short-term financing conditions. Repo rates are available for a number of selected stocks at the Vienna exchange and have so far been used only in a study on the 1873 stock exchange crash (Rieder (2018)). The evidence suggests that rates were largely firm-specific and do not allow the derivation of a benchmark rate. A single repo rate (Reportgeld) starts being reported after World War I and is available until 1938. The definition and mode of calculation of this repo rate is, however, not clear. This is another area where further research would be merited.

Housing prices

Quarterly house price indices are calculated and published jointly by the OeNB and the Technical University (TU) Vienna. The index for Vienna and sub-aggregates for single-family homes and new and used condominiums is available from 1986, for Austria from 2000. Price indices are based on hedonic regressions of offer prices on a variety of characteristics of each object as provided by a commercial data service (Brunauer et al (2012), Brunauer et al (2017)). The series are available from the OeNB and feed into the databases of the BIS and the IMF, among others.¹⁹ A second provider of house price indices is Statistics Austria, the federal statistical office. In starting the publications of its own indices in 2010, Statistics Austria responded to the needs of the scoreboard of the EU's Macroeconomic Imbalance Procedure (MIP). The Statistics Austria indices are based on prices from transactions of private households as recorded in the land registry and are calculated as weighted means of per square metre prices for several categories according to type of unit, region, size and quality (Statistics Austria (2019)).

A recent joint project of the Economics University Vienna and the central bank aimed at extending the OeNB-TU indices for Vienna back to 1900. The methodological approach was largely dictated by data availability. Offer prices, the data source of the current index, are not systematically available when going back in

¹⁹ The OeNB series follows the Special Data Dissemination Standard Plus of the IMF. <https://dsbb.imf.org/sdds-plus/dqaf-base/country/AUT/category/FSI07>.

time. The alternative are contracts kept in the land register. As the documents are organised in a chronological rather than spatial order, however, a repeat-sales index is not feasible. Instead, the historic index presented in Lampe et al (2023) uses a stratified sample, which is enriched by information on individual units as drawn from various contemporary sources. Information includes location, surface, year of build, war damage and restitution, among others. The resulting data base allows the calculation of mix-adjustment as well as hedonic indices. A general complication of a further backward extension of the Vienna house price index is due to the fact that the property registers for the central districts of Vienna were lost in a fire in 1927. The new index tries to make up for the loss by using evidence on nearby streets in outer districts and by complementing the base through newspapers. Contemporary aggregate statistics on real estate transactions are available from the 1870s until 1910 and allow to further extrapolate price trends back to the 1870s. The index is calculated up to 1990 to allow a proper splicing with the post-1986 index.

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