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Explorations in Monetary Cliometrics. The Reichsbank: 1876-1920

*Olivier Darné and Claude Diebolt**

Abstract: The seasonal unit root tests make it possible to determine the nature of the deterministic and stochastic seasonal fluctuations. In this paper, we apply this method to the original monthly series of the Reichsbank monetary stock (constructed in weekly data with 2160 observations) and emphasize deterministic seasonal fluctuations with notably a strong seasonality at the beginning and at the end of the year. This statistical result is closely related to the turning points detected by the historical analysis.

I. Introduction

One of the major characteristics of many economic time series is the presence of seasonal movements. The other main types of movements are the trend, the cycle and the irregular. For Hylleberg (1992), *seasonality is the systematic, although not necessarily regular, intra-day movement caused by changes of the weather, the calendar, and timing of decisions, directly or indirectly through the production and consumption decisions made by the agents of the economy. These decisions are influenced by the endowments, the expectations and the preferences of the agents, and the production techniques in the economy.* An important part in this definition shows that seasonal fluctuations can be deterministic because of, for example, calendar and weather effects, but they may also be caused by the behaviour of economic agents and may therefore not be constant.

In general, the study of seasonal fluctuations has a long tradition in the analysis of economic time series. Historically, seasonal fluctuations have been considered as a nuisance that obscures the more important components, i.e. the

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trend, growth and cyclical components. Consequently, seasonal adjustment procedures have been implemented to eliminate seasonality.[1] Recently, a new viewpoint has emerged, showing that seasonal fluctuations are not necessarily a nuisance. They are an integral part of economic data and should not be ignored or obscured in economic analysis. Therefore, the study of the seasonal behaviour in the series is important for model evaluation and forecasting.

Seasonal movements of economic time series might be deterministic. In this Case, they are modelled with seasonal dummies (see Barsky and Miron (1989), inter alia). Another approach is to model seasonality as a non-stationary stochastic process, i.e. seasonality evolves over time by allowing for seasonal unit roots (see, for example, Osborn (1990) and Hylleberg, Jorgensen and Sorensen (1993)).

Beaulieu and Miron (1993) Show that imposing a type of seasonality, when the other one is dominant, can involve severe bias and/or a loss of information[2] Therefore, they suggest distinguishing between determinist and stochastic seasonality by means of seasonal unit root tests.

In general, when a time series displays non-stationary stochastic seasonality, the seasonal differencing filter $(1 - B^S)$ is applied. The filter used assumes the presence of the S roots over the unit circle of this polynomial in the autoregressive representation (Box and Jenkins, 1970). Preliminary test procedures have been developed by Hasza and Fuller (1982), Dickey, Hasza and Fuller (1984),[3] and Osbom et al. (1988). These methods make it possible to test unit roots on the whole of seasonal frequencies and not only on some of them. However, when only some seasonal unit roots are present, applying a differencing filter can lead to an over-differencing of the series. Therefore, Hylleberg, Engle, Granger and Yoo (1990) [henceforth HEGY] proposed the testing of non-seasonal and seasonal unit roots separately. This test determines the appropriate differencing filter for making the time-series stationary.[4]

In this paper we present the seasonal unit root test procedure to determine the nature of seasonality (deterministic or stochastic). In Section 2, we define the main seasonal time series models and the seasonal integration notion. We describe the HEGY test procedure in Section 3. In Section 4, we apply this method to monthly Reichsbank monetary stock. Section 5 concludes the paper.

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1 The most commonly used seasonal adjustment methods are those of Census X-11-ARIMA (e.g. INSEE) and TRAMO/SEATS (e.g. Eurostat).

2 Ghysels et al. (1994) and Abeysinghe (1994) and others have shown that imposing a deterministic seasonal pattern on a series by using either seasonal dummies or applying the seasonal adjustment methods can lead to serious misspecification problems.

3 These authors have extended the Dickey-Fuller tests to the seasonal context.

4 This test procedure developed for quarterly time series has been extended by Franses (1991) and Beaulieu and Miron (1993) to monthly cases, by Franses and Hobijn (1997) and Feltham and Giles (1999) to biannual cases, by Caceres (1996) to weekly cases, and Andrade et al. (1999) and Darné, Litago and Terraza (1999) to daily cases. Smith and Taylor (1999a, 1999b) also proposed HEGY tests with arbitrary periodicity.

II. Integration and seasonality

We briefly describe the three most commonly used seasonal time series models from the quarterly time series example ($S = 4$).

1. Deterministic seasonal process

The most elementary definition is that of the seasonal dummies model (see Barsky and Miron (1989)). A purely determinist seasonal process, i.e. seasonality does not change over time, is defined as follows:

$$y_t = \alpha_0 + \sum_{j=1}^{S-1} \alpha_j D_{jt} + \varepsilon_t \qquad (1)$$

where S is the order of seasonality, the $D_{.jt}$ `s are the seasonal dummies and ε_t, is a white noise process.

This process is perfectly predictable. The study of the variation of seasonal dummies allows interesting deductions because the factors which produce such variations are often directly recognizable (climate, school calendar, etc.).

2. Stationary stochastic seasonal process

A stationary seasonal process can be generated as follows:

$$\varphi(B) y_t = \mu_t + \varepsilon_t \qquad \text{with} \qquad \varepsilon_t \sim i.i.d.(0, \sigma^2) \qquad (2)$$

where $\varphi(B)$ is a backshift polynomial operator, with $By_t = y_{t-l}$, which has all of the roots of $\varphi(z) = 0$ lying outside the unit circle, and μ_t, is a deterministic term which can include any combination of a constant, a trend and a set of seasonal dummies. The stationary stochastic seasonality is characterised by peaks at the seasonal frequencies.

3. Non-stationary stochastic seasonal process

A non-stationary stochastic process has a seasonal unit root in its autoregressive representation. This process can be generated as follows:

$$\varphi(B) y_t = \mu_t + \varepsilon_t \qquad \text{with} \qquad \varepsilon_t \sim i.i.d.(0, \sigma^2)$$

where $\varphi(B)$ polynomial has at least one unit root in its autoregressive representation, and μ_t is defined as above. The integrated seasonal process has a long memory, i.e. a shock implies a permanent effect on the seasonal model behaviour. These seasonal shifts can be caused by economic movements.

The seasonal integration notion was introduced by Engle *et al.* (1989). A series y_t is integrated to d order at the θ frequency, $y_t \sim I_\theta(d)$, if its spectrum takes the form $f(\omega) = c(\omega - \theta)^{-2d}$. If the series is only integrated at zero frequency, we obtain the

Standard integration. Moreover, a series can be integrated at one or more seasonal frequencies, $\omega_S = \pi j / S$, $j = 1$,..., $[S/2]$ (where [.] denotes the integer part), S is the periodicity.

III. Seasonal unit root test procedure

Using the framework of the Dickey-Fuller test, Hylleberg et al. (1990) developed a test procedure for non-seasonal and seasonal unit roots separately.

We consider a series y_t generated by a general autoregressive process $\varphi(B)y_t = \mu_t + \varepsilon_t$. In order to detect the unit roots at the zero and seasonal frequencies, we must rewrite the autoregressive polynomial according the Lagrange proposition (See Hylleberg *et al.*, 1990, pp. 221-222):

$$\varphi(B) = \sum_{k=1}^{p} \lambda_k \Delta(B) \frac{1-\delta_k(B)}{\delta_k(B)} + \Delta(B)\varphi^*(B) \tag{4}$$

with $\delta_k(B)=1-(1/\theta_k)B$, $\Delta(B)=\prod_{k=1}^{p} \delta_k(B)$, $\lambda_k=\varphi(\theta_k)/\prod_{j=k} \delta_j(\theta_k)$, $\varphi^*(B)$ is a remainder with roots outside the unit circle, and the θ_k's are the unit roots of the $(1 - B^S)$ polynomial, which can be written as follows:

$$\left(1-B^S\right) = (1-B)\left(1+\sum_{i=1}^{S-1} B^i\right) = (1-B)\prod_{k=1}^{[S/2]}\left(1-e^{\pm i2k\pi/S}B\right).$$

To illustrate this method, we study the quarterly data case[5] *(S= 4)*. We expand the $\varphi(B)$ polynomial around the roots 1, -1, i and $-i$, and the expression (4) gives:

$$\begin{aligned} \varphi(B) &= \lambda_1 B(1+B)(1+B^2) + \lambda_2(-B)(1-B)(1+B^2) \\ &+ \lambda_3(-iB)(1-iB)(1-B^2) + \lambda_4(iB)(1+iB)(1-B^2) \\ &+ (1-B^4)\varphi^*(B) \end{aligned} \tag{5}$$

To make estimation possible, we substitute $\pi_1 = -\lambda 1$, $\pi 2$ 0 – $\lambda 2$, $\lambda 3 = (-\pi 3 + i\pi 4)/2$ and $\lambda 4 = (-\pi 3 - i\pi 4)/2$. Finally, we replace the expression (5) in the autoregressive equation, $\varphi(B)y_t = \mu_t + \varepsilon_t$, and obtain the auxiliary regression:

$$\varphi^*(B)y_t = \pi_1 y_{1,t-1} + \pi_2 y_{2,t-1} + \pi_3 y_{3,t-2} + \pi_4 y_{3,t-1} + \mu_t + \varepsilon_t \tag{6}$$

where $y_{1,t} = (1+B+B^2+B^3)y_t = (1+\sum_{j=1}^{3} B^j)y_t$

$y_{2,t} = -(1-B+B^2-B^3)y_t$

[5] See the note 4 for the extensions proposed to other periodicities.

$$y_{3,t} = -(1-B^2)y_t$$
$$y_{4,t} = (1-B^4)y_t$$

The series $y_{1,t}$ keeps the unit root at zero frequency and eliminates the seasonal unit roots, while the series $y_{2,t}$ keeps a unit root at biannual frequency ½(root -1) and removes the roots at the zero and annual frequencies (roots 1, *i* and -*i*). On the other hand, the series $y_{3,t}$ keeps the complex conjugated roots (roots *i* and -*i*) and removes the roots at the other frequencies.

To apply the seasonal unit root tests, equation (6) can be estimated by Ordinary Least Squares (OLS). The test strategy is as follows:

- For zero frequency, one uses a one-sided t-test to test the null hypothesis $H_0 : \pi_1, = 0$, against the alternative $H_1 : \pi_1 < 0$.
  If $t_1 > t_{1, tabulated}$, H_0 is not rejected and we have a zero frequency unit root.
- For π frequency, we also use an one-sided *t*-test to test $H_0 : \pi_2 = 0$, against $H_1 : \pi_2 < 0$. If $t_2 > t_{2, tabulated}$, H_0, is not rejected and we have a unit root at the biannual frequency (π) .
- For the conjugated seasonal frequency, we use an F-statistic[6] to test $H_0 : \pi_3 = \pi_4 = 0$, against $H_1 : \pi_3 \# \pi_4 \# 0$.
- lf $F_{34} < F_{34, tabulated}$, H_0 is not rejected and we have a unit root at the annual frequency (π/2).
- Ghysels, Lee and Noh (1994) proposed *F*-statistics analogous to those of Dickey, Hasza and Fuller, which make it possible to test the unit roots at all the frequencies simultaneously with or without zero frequency (denoted $F_{1...4}$ and $F_{2...4}$, respectively).

In general, this test procedure is estimated with φ * (B) =1. However, as shown by Beaulieu and Miron (1993), we must include some lagged dependant variable (i.e. lagged fourth-order differences for quarterly data) in the auxiliary regression to whiten the residuals. Nevertheless, power and size depend on the increase of φ * (B) , as a high number of lags negatively affects the power of the test and a low number of lags implies increasing size up to a significant level. In this case, we have a wrong rejection or acceptation of unit root. For example, information criteria, such as AIC or BIC, or the sequential procedure developed by Otto and Wirjanto (1990) can be applied to select the number of Tags.[7]

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6 For complex roots, we can also test $\pi_4 = 0$ with a two-sided West, then $\pi_3 = 0$ with a one-sided t-test. Dickey (1993) and Smith and Taylor (1999b) advise the use of F-statistics rather than t-statistics because inference problems.

7 See Taylor (1997) for a detailed discussion.

IV. Application

As an original illustration, we apply the seasonal unit root tests to the monthly monetary stock of the Reichsbank (in thousands of Marks), constructed by Diebolt (in weekly data, with 2160 observations), covering the time period January 1876 to December 1920. Figure 1 displays the series in log form. The main data sources are given in the references. Our analysis begins with a historical description, for a better understanding of the economic transformations in Germany during this period.

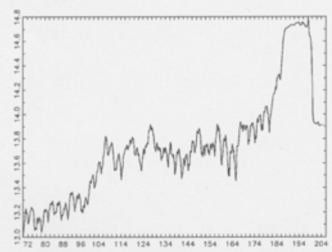

Figure 1: Reichsbank monetary stock

1. Historical study

The monetary unification of Germany was decreed on 22 September 1875. From 1 January 1876, the monetary system came into effect. A banking reform set up the Bank of Prussia as the central bank of the Empire, giving it the new name of Reichsbank in order to provide credit for the imperial government and to lead an active discount rate policy.

Before World War 1, the Reichsbank had to give up its statutory reserve because of the difficult economic situation. The period from 1876 to 1894, for example, began with a very long recession (about 6 years) followed by insufficient recovery to surmount a new depression from 1883 to 1887, marked by high unemployment and falling incomes. During these years, the private banks tried to adopt a dominating position on the money market. The Reichsbank was then forced to dip below its rate to keep the control of the market in periods of excessive liquidity. This continued until 1896.

On the other hand, the last five years of the nineteenth century were a period of extraordinary expansion for Germany. In spite of the short depressions of 1901 and 1908, the trend continued until 1913. In fact, the German economy became increasingly interdependent with foreign countries. The balance of current payments nevertheless remained positive due to the excesses of the balance of services. At this time, gold outgoings did not disturb the Mark for the Reichsbank. The general situation was favourable, the company profits increased very quickly in spite of rising prices of raw materials and foodstuffs.

It resulted from intense technical progress and from a very dynamic economic and commercial organization based on a strong vertical and horizontal integration as well as a close connection between the industrial and Banking sectors.

The Mark gradually became one of the strongest gold-backed currencies. However, it was also necessary to prepare for war from a financial viewpoint. From 1911, one notes a convergence of economic and financial reforms towards a definite political purpose. During this period, monetary preparation for the war consisted of disciplining banks so that they increased reserves, persuading the public to use cheques rather than coin (not to use gold reserves) and, for the Reichsbank, to increase its gold reserves. This was the preoccupation of the law that authorized the issuing of 20 and 50 Mark banknotes, and that of the patriotic manufacturers who began paying their workers systematically with small denomination banknotes. Leading citizens and traders in Berlin and administrations followed in order to contribute to the improvement of arnament. Furthermore, a war chest was constituted, of which Hume had already spoken ironically in the eighteenth century with reference to the money accumulated by the «king-sergeant», Frederich William I. Nevertheless, the result was fairly extraordinary.

The last balance sheet of the Reichsbank during the peace period, that of 23 July 1914, exceeds all that one can expect, because for the first time the money was covered to 90% by cash in hand (reserves), without counting the Supplement of the war treasure. The margin of non-taxable issue then exceeded 3 billion francs. Financial mobilization was as easy as military mobilization (from the ultimatum of Austria-Hungary to Serbia). The Reichsbank was ready to play its role of «war bank» until the moment when Russian gold was required at Brest-Litovsk. This was followed by accelerated depreciation, total bankruptcy of the Mark (alter the World War 1), a unique event in monetary history. It was a period of violent political opposition, great misery and also the enrichment of discriminating investors. We continue our analysis with the presentation of econometric test results.

2. Econometric results

Because the data are monthly, we use the test procedure developed by Beaulieu and Miron (1993), which is an extension of the HEGY test to monthly case. Table 1 Shows that a unit root at zero frequency is not rejected, while the seasonal unit roots are rejected. Therefore, applying a first differences filter makes the series stationary and the seasonal fluctuations are not non-stationary stochastic (i.e. seasonality does not evolve over time). However, study of AIC and BIC information criteria (See Table 2) Shows that the best model is that including seasonal dummies and we then estimate this model on the differenced series (See Figure 2).

Table 1: Seasonal unit root tests

Reg	t_1	t_2	F_{34}	F_{56}	F_{78}	F_{910}	F_{1112}	$F_{1..12}$
nc,nd,nt	0.48	-3.84*	25.88*	4.79*	9.26*	10.80*	9.86*	13.18*
c,nd,nt	-1.70	-3.84*	25.81*	4.78*	9.32*	10.77*	9.73*	13.14*
c,nd,t	-2.77	-3.87*	25.72*	4.70*	9.55*	10.74*	9.57*	13.13*
c,d,nt	-1.65	-4.72*	32.48*	11.18*	18.47*	15.98*	21.77*	21.98*
c,d,t	-2.79	-4.76*	32.51*	10.95*	18.95*	15.95*	21.55*	22.00*

* Significant at the 5% level. The auxiliary regression can include (no) constant, ((n)c), (no) seasonal dummies, ((n)d) and (no) trend ((n)t). The number of lagged fourth-order differences in each regression is four.

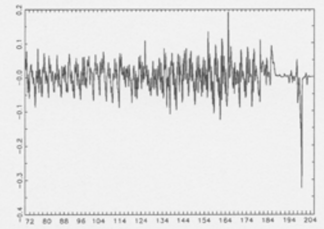

Figure 2: Differenced monetary stock series

Table 2 Shows that almost all the seasonal dummies are significant and that the series includes deterministic seasonality, even if it is very weck. It is noted that the seasonal fluctuations of Reichsbank monetary stocks are greater at the beginning and the end of the year since the t-statistics are strongly significant.

Table 2: Models and parameters estimations

Models						
Criteria	nc, nd, nt	c, nd, nt	c, nd, t	c, d, nt	c, d, t	
AIC	-6.23	-6.23	-6.23	-6.76	-6.75	
BIC	-6.23	-6.23	-6.22	-6.67	-6.65	
Seasonal dummies						
	D_1	D_2	D_3	D_4	D_5	D_6
Coefficient	0.036	0.052	-0.001	-0.015	0.028	0.002
t-statistic	7.15	10.24	-0.17	-3.06	5.55	0.35
	D_7	D_8	D_9	D_{10}	D_{11}	
Coefficient	-0.023	1.7710^{5}	-0.043	-0.042	0.030	
t-statistic	-4.59	0.01	-8.54	-8.38	6.00	

V. Conclusion

The seasonal unit root tests developed by Hylleberg et al. (1990) make it possible to determine the nature of the deterministic or stochastic seasonal fluctuations. It also provides additional information concerning the historical analysis of the time series. We apply this method to the original monthly series of the Reichsbank monetary stock and emphasize deterministic seasonal fluctuations, with notably a strong seasonality at the beginning and the end of the year. This statistical result is closely related to the turning points detected by the historical analysis. This displays, once again, the power of the cliometric approach for the interpretation of Economic movements.

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Table 3: Reichsbank monetary stock (in thousands of Marks)

	1876	1877	1878	1879	1880	1881	1882
1	443180.25	528684.50	468448	490689	557785.75	540556.50	528252.50
2	471694.25	549970.50	510168.25	527098.25	579899.75	577480.75	543483.50
3	497914.25	551575.50	516701.75	549610.25	580866.75	584466.25	560371
4	509551.50	562983.25	494856	540425.50	574515.50	569571.25	553199
5	550700.25	553730.25	505686	550725.75	581886.50	576757.50	574046.50
6	557344	554107.75	518535	553841.25	593223	591155	584720.50
7	533789.50	547026.75	509089.25	544668.25	575912.25	577400.75	562056
8	538879.75	527960.75	510113.75	547944.50	552041.50	566129.75	552469.25
9	523020	484260.75	484340.50	527242.50	529896.75	537052.25	528867.50
10	492411.25	466092.50	458174.75	497553.25	536080.25	506914.25	509691.25
11	498807.25	475574.50	468725.25	530918.50	543418.50	523992.75	532976
12	509822.50	475275.75	484021.50	550133.50	539562.75	529516.50	557678.50
	1883	1884	1885	1886	1887	1888	1889
1	597969.25	583331.25	537554.50	652680.75	697400.50	802170.25	886454.75
2	628942.25	617128,25	570203.50	694961.25	745580.50	847353.50	926882.25
3	630456.50	613936.25	572529.50	698420.50	754330.50	859130.50	931772.25
4	619578.75	600227.25	560161.75	683943.50	761421.75	887853	929567.75
5	632622	624476.25	595033.50	704109.75	793051.75	957144	954914.75
6	635409.25	629210.50	610821	715778.25	815992.25	1002229.50	943273.75
7	611654.75	608803	594737.75	727539	810812	991806.25	901792.50
8	606657.25	605331	594632.50	733742.25	814201.75	975893.25	877706
9	576195.25	579297	576728.50	702276.75	778403.25	924110.50	817348.75
10	542488.50	543386.75	579275.50	656875	739427.75	862177.50	758614
11	563614	553425.50	610241.50	665081	774708	861568	767678.25
12	576794.25	542143.75	631647.75	681855.50	783021.25	869396	763095
	1890	1891	1892	1893	1894	1895	1896
1	766837.25	801260.75	942431	886331.75	849617.50	1066024.75	907895.75
2	810424	858318.50	974322.75	916753	906303	1104342.25	951880.75
3	825545.75	867610.50	970452.25	910128	898007.75	1077983.75	926061.50
4	823027.25	873757.25	944647.75	860607.75	868129.75	1054139	893917.50
5	860616.75	900043.25	980232.25	876319	908704	1077715	915380.50
6	872840.75	912910.50	997755.50	862240	931055.25	1058778.25	917740.50
7	843645	906775	986177	809319	917979.75	1016671.50	890232
8	815729	936071.75	977674.25	808877.25	949431	1013173.50	911750.25
9	767537.25	924436.25	936877	781240.75	944638	962875.50	869520.75
10	702783.75	899039	869763.75	758735.50	940618.75	913066	823392
11	754003	922203.25	865147.50	805477.75	1047002.75	911741.50	850720.75
12	769239.75	923043.25	859409.25	824650	1050445.50	884641	845368.75
	1897	1898	1899	1900	1901	1902	1903
1	861130.75	890014	821421.25	782227.25	823833.75	972077.25	877248
2	911802.75	956092	881772	837330	890859.50	1049452.50	933360
3	909775	947885.25	887296	822012.50	886644.25	1036102.75	900056.75
4	876903	868440.25	867335.50	787394.75	880007.25	1024579	859333.50
5	915213.75	865850	906646.50	837377.75	957068	1068136	915859.75
6	913900.75	866660.50	900861.75	856115.75	967197.75	1067286.25	936044
7	872439.75	843392	843690	862151.75	948822.25	1025100	923932
8	874605.75	867559.25	840205.75	867081.75	959286	1010854.50	946587.25
9	822874	818291.75	779973.50	805733	907256.75	932833.50	927825.50
10	780823.50	734595.25	709169	757641.25	874962.25	866832.75	876329
11	849478	758270	730493.50	799638.75	924365.50	883727.75	900968.75
12	868452.25	794211.25	736895.50	790937	916634.25	849441.75	861800.25

	1904	1905	1906	1907	1908	1909	1910
1	890906.25	1033337	928168.50	809758.75	847477.25	1089503.25	1042313.50
2	943121	1106784.50	985628	889020	928156.25	1102714.25	1096599
3	924042.50	1092001	973926.50	871599.75	925189.25	1078663.75	1089530.25
4	901829	1046125.25	960628.50	886198.50	927425.50	1056025	1108739
5	946666.50	1077804.75	1014035.25	942235.50	970306.25	1075742.5	1122789
6	952159.75	1052339.25	971482.75	924824	1060922	1097839	1120341
7	917891.50	971588.25	914538.25	880284.50	1101373.5	1076358.25	1072925
8	938326.25	958448.25	912890.25	899933.75	1130507	1093576.75	1065798.75
9	883466.50	861590	805184	833263	1103991	1024911	1003409
10	854057	792778.75	727403.50	764414.25	1068387	937576.50	950578
11	976502.75	838666.50	774092.50	718210.50	1096004.5	976071.50	1006290
12	991060	844042.75	723606.50	700335	1044036	962021	982820

	1911	1912	1913	1914	1915	1916	1917
1	1072596.25	1147405	1153950.25	1555868	2185295.7	2489416.25	2539690.75
2	1159081	1230067	1196851.75	1624132.2	2283558.2	2499235.25	2542294.25
3	1140523	1213883	1213007	1622067	2361488.2	2503649.50	2545450.25
4	1121715.25	1221185.50	1259200.75	1639462	2404454	2504275	2548768.75
5	1181741.25	1261297	1309006.75	1662903.7	2426539.7	2501774.75	2558514
6	1182539.50	1284025.75	1372364.50	1670076.7	2433944.2	2499436	2548570.75
7	1191020.25	1279708.75	1416585.50	1628522	2440862.7	2496829.50	2501224
8	1195423.50	1278429	1421053.25	1597222.5	2451687	2495509.50	2491526.50
9	1095555.75	1222299.75	1429495.25	1678816.2	2456956	2495535.75	2507411.50
10	1049415.50	1156609.75	1457054.75	1840658.5	2463587.2	2517904	2511809.50
11	1105055	1113262.75	1508052.50	1976772.5	2470625.7	2532599.25	2556431.50
12	1056243.25	1034964	1471348.50	2100993.7	2475165	2535676	2564499

	1918	1919	1920
1	2519737.25	2276337.75	1108106.25
2	2522501.75	2269211	1113850.50
3	2525651.50	2167907.50	1125966.25
4	2496306	1894230.50	1121816.75
5	2465692.50	1650131.50	1095145.75
6	2466590	1192025.75	1095045.25
7	2467781.25	1132006.75	1096812.50
8	2467705.75	1125270.75	1098693.25
9	2515440.50	1118179.25	1098429.25
10	2647204	1114392.50	1098544
11	2451900.25	1112201.50	1098379.50
12	2304460.50	1110890	1097658