ECB liquidity lines

Silvia Albrizio (IMF)
Iván Kataryniuk (BdE)
Luis Molina (BdE)
Jan Schäfer (CEMFI)

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The paper in a nutshell

Central Bank liquidity lines are key part of the international financial safety net. However, the evidence on ECB euro lines is scarce.
This paper:

- **ECB facilities timeline**: ECB Regional LOLR
- **Direct signalling effect**: The premium paid by foreign agents to borrow euros in FX markets decreases by 76 basis points relative to currencies not covered by these facilities.
- **Spillback effect**
  - **Stylized model**: CB liquidity lines, by reducing the probability of default of the recipient-country banks, increase the expected profits of Euro Area (EA) banks that hold claims in the recipient-country, ultimately increasing their stock prices.
  - **Empirical evidence**: Banks´ equity prices increase by about one standard deviation in EA countries highly exposed via banking linkages to countries whose currencies are targeted by liquidity lines.
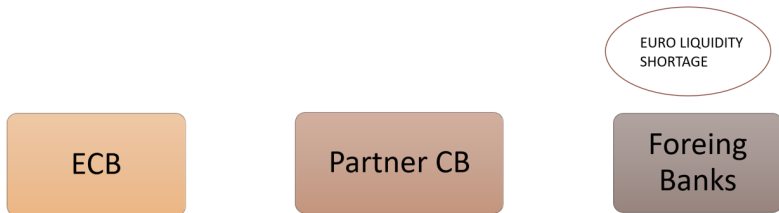
ECB

Partner CB

Foreing Banks

ECB
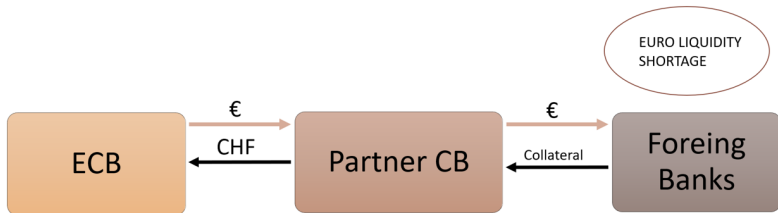
Partner CB

Foreing Banks
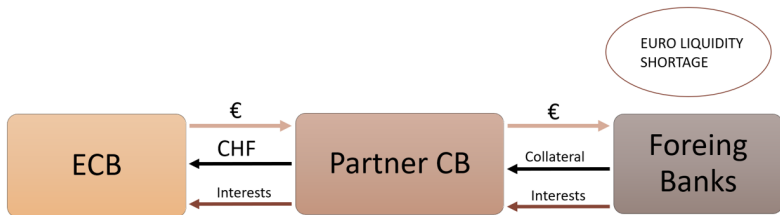
EURO LIQUIDITY SHORTAGE

NO EX.RATE RISK:
Fixed spot rate

EURO LIQUIDITY SHORTAGE

€

ECB

€

CHF

Partner CB

Collateral

Foreing Banks

Interests

Interests
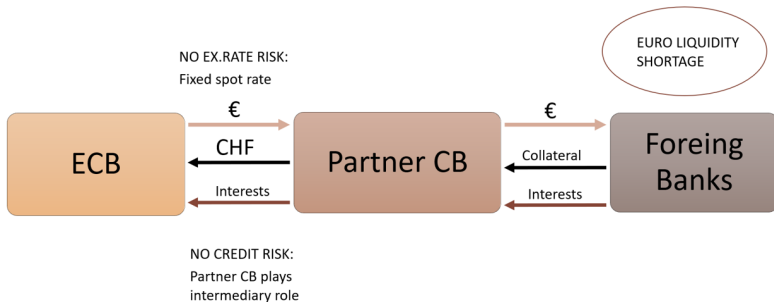
NO CREDIT RISK:
Partner CB plays
intermediary role

Historically, three main objectives:

- Defend a peg system more generally FX interventions: Bretton Woods (Bordo et al. (2015)), Bahaj Reis (2022a))
- Stabilize the financial system by providing a liquidity backstop (LOLR): GFC and COVID-19, preventing runs and reducing fire sales (Bahaj Reis (2022b) among others)
- Jump-start the international use of the domestic currency: China (Bahaj and Reis (2020))
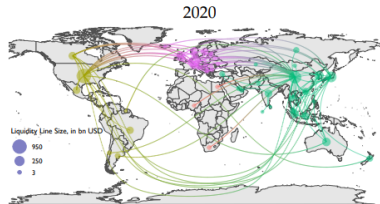
Source: Bahaj and Reis 2021

Effects of central bank liquidity lines

Fed liquidity lines

- Ceiling on CIP deviation during GFC and Covid - Baba and Packer (2009), Bahaj and Reis (2020, 2022), Moessner and Allen (2013), Cetorelli et al.(2020), among others
- Appreciation of targeted currencies: Aizenman et al. (2022)
- Reduction of long interest rate and sovereign CDS Aizenman et al. (2022)
- Positive spillbacks Bahaj and Reis (2022)
- Substitution effect and liquidity provision Ferrara et al. (2022)
- Macro effects Cesa-Bianchi et al. (2022)

What about the ECB?

ECB and National Bank of Serbia set up repo line to provide euro liquidity

›   ECB and National Bank of Serbia set up repo line

›   Repo line to remain in place until June 2021, unless an extension is decided

›   Size of repo line set at €1 billion

›

The European Central Bank (ECB) and Народна банка Србије (National Bank of Serbia) have agreed to set up a repo line arrangement to provide euro liquidity to Serbian financial institutions to address possible euro liquidity needs in the presence of market dysfunctions due to the COVID-19 shock.

Under a repo line, the ECB provides euro liquidity to a non-euro area central bank in exchange for adequate euro-denominated collateral.

Under the repo line, the National Bank of Serbia will be able to borrow up to €1 billion from the ECB. The maximum maturity of each drawing will be three months. The repo line will remain in place until the end of June 2021, unless an extension is decided.

Timeline of ECB liquidity lines

Based on ECB press releases, the timeline reports 68 announcements from 2001 to April 2022:

- Inclusions: new lines, volumes and time extensions, change in conditions (pricing, auction frequency, maturity)
- Exclusions: EUREP, discontinuations of lines, frequency or maturities of the operations.
- Reciprocal agreement and motivation: even when agreements are reciprocal, there is an explicit indication of the lines currency-denomination - ex. G10 network
- Ex post/out of ECB PR announcements: ex. Sveriges Riksbank

ECB liquidity lines: financial stability tool

NO EURO PROVISION

- 🔺 New swap line
- 🔺 Swap time extension
- 🔺 Swap collateral or rate changes
- 🔺 Swap volumen expansion
- 🔺 Swap activation or reactivation
- 🟧 New repo line
- 🟩 Repo time extension

EURO PROVISION
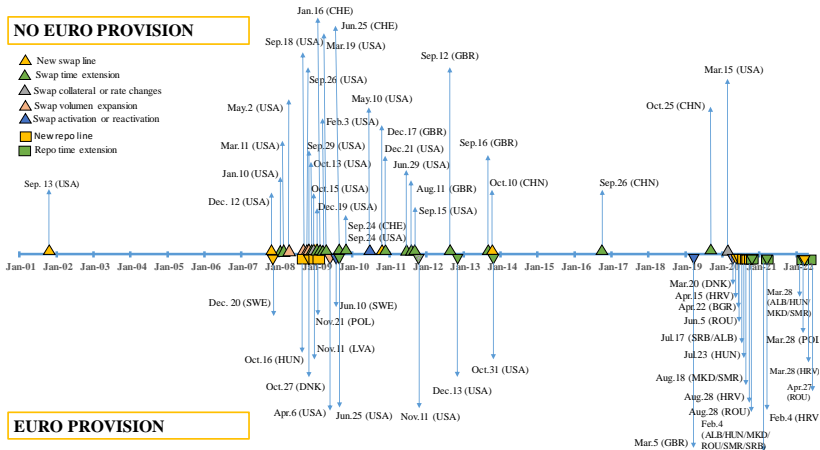
(USA) stands for agreement within the G10 network comprising Bank of Canada, Fed, Bank of Japan, Swiss National Bank, Bank of England, ECB.

Type of ECB liquidity facility
Total number of announcements
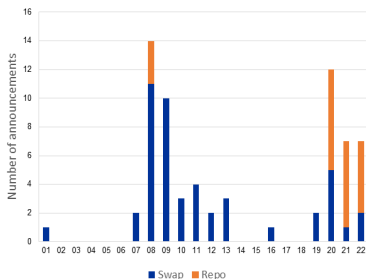
Motivation: Euro versus non-euro provision
Total number of announcements

Repo lines
Swap lines
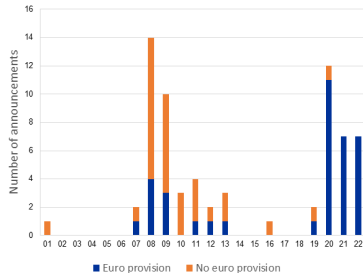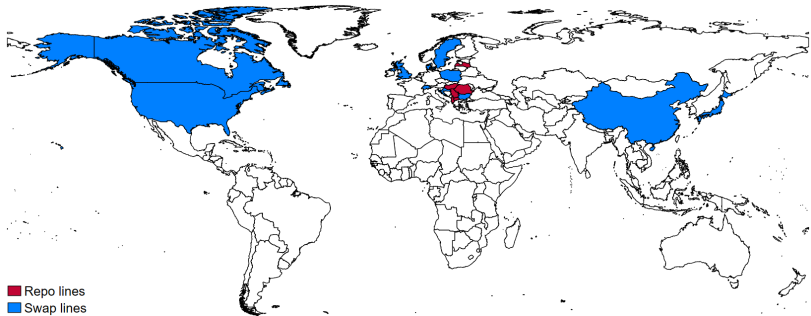
Direct effect

We study the announcement effect of the ECB euro liquidity lines on euro funding cost in the FX market.

Mechanism: Central bank liquidity lines provide recipient-country banks with a cheaper outside option to the FX market which improves the bargaining terms that the recipient-country banks obtain from the traders (Bahaj and Reis (2022)).

Signaling effect: by the theory of the term structure, this argument holds also in the case of the mere announcement of a liquidity line, which ultimately cap the price of forward agreements.

In presence of frictions, the covered interest parity deviations correspond to the premium paid by foreign agents to borrow euros in the FX market compared to the money market.

$$B_t = ln(F_t) - ln(S_t) - (r_t - r_t^*)$$

Direct effect: identification

Sporadic announcements during FX market dysfunctions: Identification combines high-frequency data and Difference-in-Difference estimator (DiD).

- CIP changes in the short window around the announcement (Gertler and Karadi, 2015; Bahaj and Reis 2022).
- Multiple periods and groups, where the treatment is staggered over time and not an absorbing state: control group is composed of treated currencies at future or past dates (Fadlon and Nielsen 2020)
- Reduced number of events: pooled panel (Bertrand et al. 2004)
- Purge ex-antes country-specific factors from the CIP deviations (the FX swap basis) to take advantage of longer time series. [Recipient-country stock market volatility, change in public debt, current account balance, sovereign rating, sovereign yield, short-term debt, reserves and inflation]
- Restricted sample: Bulgaria, Denmark, Croatia, Hungary, Poland, Serbia, and Sweden (6 October 2008 to 28 August 2020). Total of nine events.

$$\beta_t = (y_t^T - y_t^{NT}) - (y_{t-1}^T - y_{t-1}^{NT})$$

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Graphical inspection of Basis

Figure 1: Basis Density Before and After Announcement

Direct effect: Empirical specification

DiD framework via a two-way fixed effect approach:

$$res_{i,t,e} = \quad \beta_1 T_{i,e} \times Post_t + \beta_2 T_{i,e} + \sum_e \beta_{3e} Post_{t,e} + \beta_4 mp_t + \varphi' Z_t + \mu_{i,e} + u_{i,t,e}$$

$T_{i,e}$ dummy equal to one for treated currency i at event e, zero otherwise

$Post_t$ dummy equal to one in $[t, t+1]$ and zero in $[t-2, t-1]$, where t is the announcement day.

$Post_{t,e}$ post-announcement effect, allowed to differ at each event e

mp_t and Z_t, monetary policy announcements, Global Citi Economic Surprise Index and the EU high-yield spread

$\mu_{i,e}$ currency*event FE (same clustering dimensions)

β_1 is the ATE, the weighted average effect of the announcement conditional on being treated.

Direct effect: Results

Dependent Variable: FX Basis Residuals		
	Baseline Sample	
	(1)	(2)
Treated_Post	-0.765**	-0.765**
	(0.022)	(0.023)
MP meetings		-0.214**
		(0.049)
EU high yield		-0.957**
		(0.026)
Surprise index		-0.00144
		(0.205)
Observations	220	220
R^2	0.127	0.181
CurrencyxEvent FE	yes	yes
PostMat	yes	yes

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness

- Include Norway and Iceland (▸ extended)

- Placebo: move the announcement date three days before the actual event. (▸ placebo)

- Basis as dependent variable instead of the residuals

- Event study: time-series regression of the FX basis residuals on the post-treatment dummy, a vector of controls and monthly dummies. (▸ ts)

- Estimate each event separately: standard twoway FE, synthetic DiD estimator, and the synthetic control estimator.

Spillback effect: the mechanism

A stylized three-period model with two agents.

The Euro Area bank's balance sheet in t is:

$$C_t^R = D_t + E_t$$

its equity at $t+1$ is given by:

$$E_{t+1} = \Pi_{t+1}^R C_t^R - (1+r)D_t$$

We assume that the gross return that the source-country bank obtains from the credit to the recipient-country bank is:

$$\Pi_{t+1}^R = \begin{cases} (1+r^C) \text{ under no default} \\ \lambda\epsilon(0,1) \text{ under default} \end{cases}$$

Let p_t^R denote the probability of default. Then, the expected return on the recipient-country bank's debt at $t+1$ is given by:

$$\mathbb{E}_t \Pi_{t+1}^R = (1 - p_t^R)(1+r^C) + p_t^R \lambda$$

Spillback effect: the mechanism

The expected value of the bank's equity is:

$$\mathbb{E}_t E_{t+1} = (\mathbb{E}_t[\Pi_{t+1}^R] - (1+r))C_t^R + (1+r)E_t$$

And therefore

$$\frac{\partial \mathbb{E}_t E_{t+1}}{\partial \mathbb{E}_t \Pi_{t+1}^R} = C_t^R > 0$$

Finally, the stock prices of the bank are determined by the shareholders' expected value of the bank:

$$V_t = \beta \mathbb{E}_t E_{t+1}$$

EA bank´s stock prices are strictly increasing in the return on recipient-country bank´s debt at time $t+1$.

Spillback effect: the mechanism

The recipient-country bank´s balance sheet in t (in EUR) is:

$$L_t^R = C_t^R + S_t B_t^R$$

At $t+1$: C_t^R matures and the recipient-country bank needs to refinance the obligation. Since it will receive payoffs from the euro-denominated asset L_t^R only at time $t+2$, the bank enters into a swap agreement with source-country traders.

Let´s define the cost of refinancing one unit of euro as $1 + b_t = 1 + r_t^R + f_t - s_t$. Which corresponds to the basis less the return to euro deposits.

Spillback effect: the mechanism

It is therefore worthwhile for the recipient-country bank to refinance its debt if:

$$(1 + b_{t+1})(1 + r^C)C_t^R \leq (1 + r_L)L_t^R \qquad \text{(-3)}$$

If this condition is not fulfilled, the bank defaults on its debt obligation. Let p_t^R denote the probability of default:

$$p_t^R = Pr((1 + b_{t+1})(1 + r^C)C_t^R < (1 + r_L)L_t^R) \qquad \text{(-2)}$$

$$p_t^R = Pr\left(1 + b_{t+1} > \frac{(1 + r_L)L_t^R}{(1 + r^C)C_t^R}\right) \qquad \text{(-1)}$$

At time t, after banks have chosen their positions, the ECB announces a liquidity line with the recipient-country. b_{t+1} and, consequently, p_t^R decrease upon announcement. This in turn increases the expected $t + 1$ return on the debt for the source-country bank, increasing, eventually, the expected value V_t and its stock prices.

Spillback effect: Econometric specification

Leveraging on the cross-country EA heterogeneity, we empirically test the prediction of the model:

$$\Delta PRes_{j,t,e} = \beta_1 Post_t \times E_{j,e} + \sum_e \beta_{2e} Post_{t,e} + \beta_3 E_{j,e} + \beta_4 mp_t + \varphi' Z_t + \mu_{j,e} + u_{j,t,e}$$

$\Delta PRes_{j,t,e}$ is the change in the purged average stock price of the banks in EA country j at time t in the event e.

EA country specific-controls: T-bills rate, nominal effective exchange rate deviations, banking system´s net foreign assets, loan to deposit ratio.

$E_{j,e}$ is a dummy equal to one if the average share of banking claims of the EA country j on the non-EA country targeted by the line at event e is above the 75th percentile of the cross-country exposure distribution, and 0 otherwise.

Spillback effect: Results

	(1) Banking Exposure p75	(2) Banking Exposure p65	(3) Continuous
Post $\times$ Exp	5.831*	6.183*	8.246*
	(0.06)	(0.06)	(0.07)
VIX	-0.623	-0.623	-0.623
	(0.37)	(0.37)	(0.37)
EU high yield	12.05	12.05	12.05
	(0.12)	(0.12)	(0.12)
MP meetings	0.360	0.360	0.360
	(0.92)	(0.92)	(0.92)
Observations	248	248	248
R^2	0.217	0.218	0.238
Controls	full	full	full
CurrencyxEvent FE	yes	yes	yes
PostMat	yes	yes	yes

p-values in parentheses. The EA sample comprises AT, BE, DE, ES, FI, FR, IR, PT, IT.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Conclusions

In this paper, we show that:

- The ECB has become a regional lender of last resort in contrast with the Fed which took on the role of global LOLR.
- ECB euro lines have been effective in decreasing the premium paid by foreign agents to borrow euros in FX markets.
- Positive spillbacks can arise in theory, and we provide empirical evidence consistent with this prediction.

If CB liquidity lines become even more present in the CBs toolkit (via permanent agreement or temporary but predictable) mkt participants may anticipate that euro liquidity in FX market will but sufficient and CIP deviation will be even small in times of crisis. These considerations are particularly relevant in the current conjuncture (war in Ukraine and risk of fragmentation).

Thanks for your attention

Additional slides

Event list

The included nine events are the following:

- October 16, 2008: Repo agreement with the Hungarian National Bank (HU)
- October 27, 2008: Swap agreement with the Danmarks Nationalbank (DK)
- November 21, 2008: Repo agreement with the National Bank of Poland (PL)
- June 10, 2009: Activation of the swap agreement signed with the Sveriges Riksbank (SE)
- March 20, 2020: Reactivation of the swap line with Danmarks Nationalbank (DK)
- April 15, 2020: Precautionary swap agreement with the Central Bank of Croatia (HR)
- April 22, 2020: Precautionary swap agreement with the Bulgarian National Bank (BG)
- July 17, 2020: Repo agreement with the National Bank of Serbia (RS)
- August 28, 2020: Extension of the repo facility with the Central Bank of Croatia (HR)
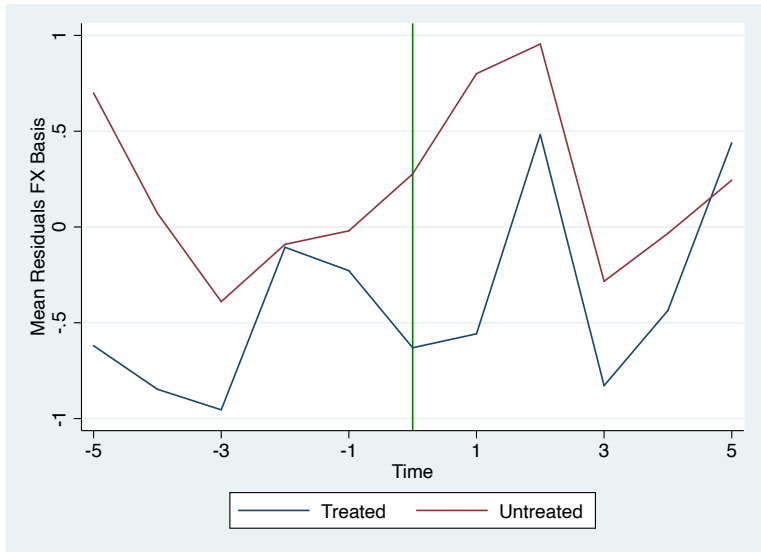
Figure 2: Residuals Before and After Announcement

Extended sample

Table 1: Effect of ECB liquidity swap line announcement

Dependent Variable: FX Basis Residuals

	Baseline Sample		Extended Sample	
	(1)	(2)	(3)	(4)
Treated_Post	-0.765**	-0.765**	-0.602**	-0.602**
	(0.022)	(0.023)	(0.026)	(0.027)
MP meetings		-0.214**		-0.0408
		(0.049)		(0.761)
EU high yield		-0.957**		-0.535
		(0.026)		(0.281)
Surprise index		-0.00144		-0.00218**
		(0.205)		(0.022)
Observations	220	220	292	292
R^2	0.127	0.181	0.065	0.082
CurrencyxEvent FE	yes	yes	yes	yes
PostMat	yes	yes	yes	yes

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Placebo

	Baseline Sample		Extended Sample	
	(1)	(2)	(3)	(4)
Treated_Post	-0.162	-0.162	0.00684	0.00684
	(0.709)	(0.711)	(0.989)	(0.989)
MP meetings		0.0787		0.419
		(0.881)		(0.453)
EU high yield		-0.374		-0.172
		(0.432)		(0.677)
Surprise index		0.0309		0.0327
		(0.253)		(0.247)
Observations	220	220	292	292
R^2	0.045	0.066	0.036	0.052
CurrencyxEvent FE	yes	yes	yes	yes
PostMat	yes	yes	yes	yes

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Time series event study

	Baseline Sample		Extended Sample	
	(1) Residuals	(2) Residuals	(3) Residuals	(4) Residuals
post	-0.863**	-0.850**	-0.898**	-0.890**
	(0.029)	(0.035)	(0.013)	(0.014)
MP meetings	-0.0411	-0.0429	0.0117	0.00930
	(0.442)	(0.411)	(0.846)	(0.874)
EU high yield		-0.0152		-0.00920
		(0.726)		(0.763)
Surprise index		-0.000288		-0.000581
		(0.765)		(0.473)
Observations	11000	11000	14483	14483
R^2	0.047	0.047	0.075	0.075
MonthFE	yes	yes	yes	yes
CurrencyFE	yes	yes	yes	yes

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

◄◄ back

Data: stock prices

Stock Prices are sourced from Datastream (Refinitiv) and are country aggregates from the following banks:

- Germany: Deutsche Bank, Commerzbank, Aareal, Deutsche Pfandbriefbank, Procredit and Umweltbank
- France: BNP, Crédit Agricole, Société Generale, Natixis, Nord CCI, Ille de France, Brie Picardie, and Crédit Foncier
- Italy: Intesa, Unicredit, Generali, BPM, BPER, Finecobank, Monte dei Paschi, Credito Emiliano, Illimity, Sondrio, Profilo, Sistema, Piccolo credito
- Spain: Santander, BBVA, Caixabank, Bankinter, Sabadell, Liberbank and Unicaja
- Belgium: KBC, Banque Nationale de Belgique and KBC Ancora
- Austria: Erste, Raiffeisen, BAWAG Group, Oberbank, BKS, Addiko Bank, and Bank für Tirol und Vorarlberg
- Finland: Nordea and Aktia
- Ireland: Bank of Ireland and Permanent THB
- Portugal: Banco Comercial Portugues

Exposure dummy

Announcement	AT	BE	DE	ES	FI	FR	IR	IT	PT
16oct2008	1	1	1	1	1	0	0	1	0
27oct2008	1	0	1	1	1	0	1	0	1
21nov2008	1	0	1	1	1	1	0	1	0
10jun2009	1	0	1	1	1	0	1	0	1
20mar2020	1	0	0	0	0	0	1	0	1
15apr2020	1	0	0	0	0	1	0	1	0
22apr2020	1	1	0	0	0	1	0	0	0
17jul2020	1	0	0	0	0	1	0	1	0
28aug2020	1	1	0	0	0	0	0	1	0