

# Diverse examples of the custom `sie_function`

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## Overview

The aim of this document is to share diverse examples on how to use the custom function `sie_function`, developed to get a quick view of diverse selected SIE series.

For details of the code of this function, look at the Rscript `SIE_function.R` in the `src` folder of this repository.

## SIE's Series Catalogue

This notebook shows diverse examples using different time series published by Banco de Mexico in the SIE, using series as exchange rates, operations and number of ATMs, retail transactions, among other series.

[Click here](#) to look for the complete catalogue of the SIE's time series published by Banco de Mexico.

## Examples

The time series used in this notebook for examples are:

1. Exchange Rate, of U.S. Dollar, Canadian Dollar, British Pound, Australian Dollar, and Euro to Mexican Pesos, since 2000.
2. Operations in ATMs with Debit and Credit Cards.
3. Number of ATM for the eight most-populated States in Mexico, since 2010.
4. Retail payment systems transactions at ATMs, POS, Checks, and Transfers by Electronic Payments, Internet Banking and Phone, from 2016 to 2019.
5. Consumer Price Index (INPC), main index and subindexes, during Enrique Peña Nieto's Presidency of Mexico (2012-2018).
6. Twenty pesos comparison of Banknotes vs. Coins, since 2000.
7. Banknote lifetime.
8. Remembrance of banknote security features.
9. Mexican Public Sector Revenues vs Expenditures

## 0. Load libraries and set token

The first step to use the custom function is load the library, as well to call and set the token.

```
# load libraries
library("siebanxicor")
library("tidyverse")
```

```
## -- Attaching packages ----- tidyverse 1.3.0 --
```

```
## v ggplot2 3.3.2      v purrr  0.3.4
## v tibble  3.0.3      v dplyr   1.0.2
## v tidyr   1.1.2      v stringr 1.4.0
## v readr    1.4.0      v forcats 0.5.0

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
# bring the token
token_file <- read.csv("../token/SIE_Token.csv", header=FALSE)

# set the token
setToken(token_file$V2)

# call the custumed function from the RScript
source("SIE_function.R")
```

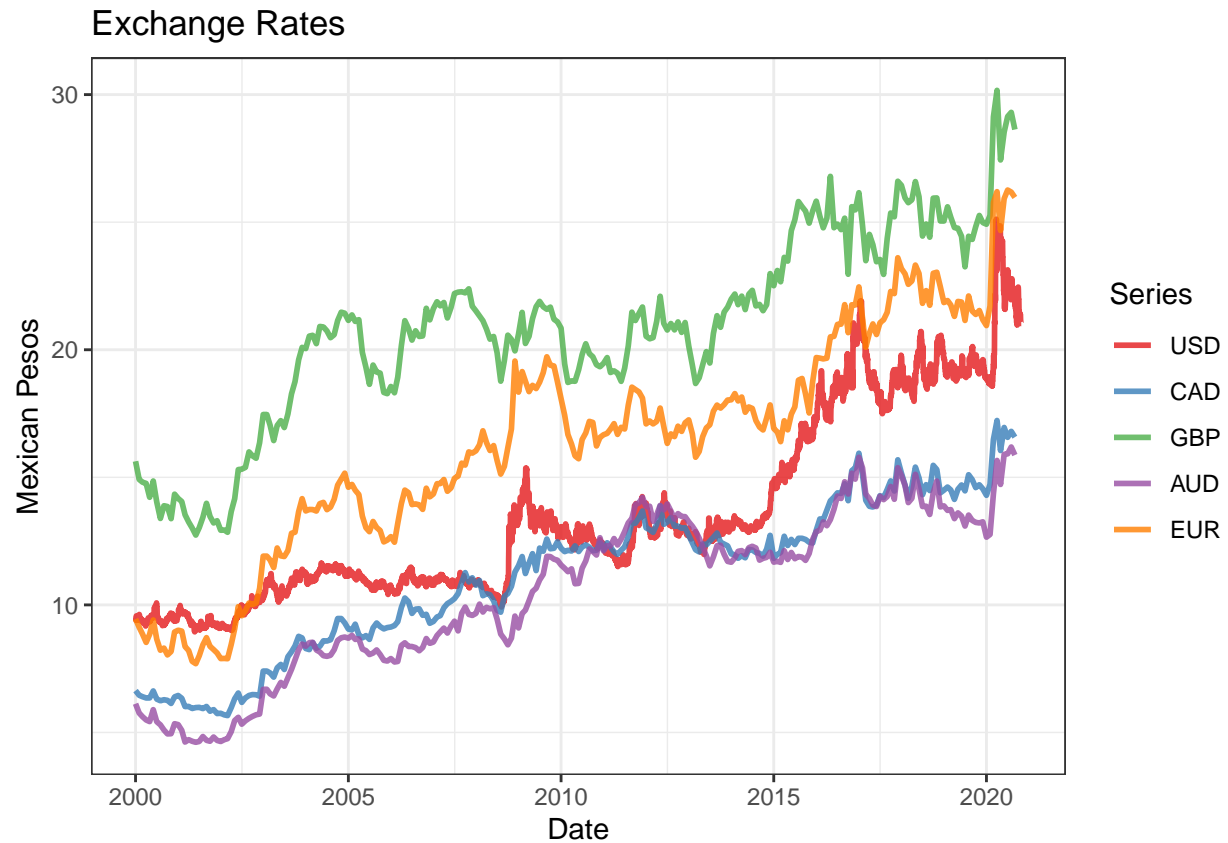
## 1. Exchange Rate

Exchange rate of U.S. Dollar, Canadian Dollar, British Pound, Australian Dollar, and Euro to Mexican Pesos, since 2000.

```
serie_tc <- c("SF60653", "SF57771", "SF57815", "SF57753",
              "SF57923")
name_tc <- c("USD", "CAD", "GBP", "AUD", "EUR")
title_tc <- "Exchange Rates"
my_start <- '2000-01-01'
my_y <- "Mexican Pesos"
my_x <- "Date"

# run the function
df_tc <- sie_function(serie_tc, name_tc,
                      title_tc, route="../img/",
                      y_lab = my_y, x_lab = my_x,
                      startDate=my_start)
```

```
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```



```
## idSerie
## 1 SF60653
## 2 SF57753
## 3 SF57923
## 4 SF57815
## 5 SF57771
##
## 1 Exchange rate pesos per US dollar Used to settle liabilities denominated in fo
## 2 Foreign Exchange Rates for Fiscal Valuation Purposes used by Banco de México AUD Aust
## 3 Foreign Exchange Rates for Fiscal Valuation Purposes used by Banco de México EUR E. Monetary U
## 4 Foreign Exchange Rates for Fiscal Valuation Purposes used by Banco de México STG United Kingdom (P
## 5 Foreign Exchange Rates for Fiscal Valuation Purposes used by Banco de México CAD C
## startDate endDate frequency dataType unit
## 1 1991-11-14 2020-10-28 Daily Exchange Rate Pesos per US Dollars
## 2 2000-01-01 2020-09-01 Monthly Exchange Rate Pesos
## 3 2000-01-01 2020-09-01 Monthly Exchange Rate Pesos
## 4 2000-01-01 2020-09-01 Monthly Exchange Rate Pesos
## 5 2000-01-01 2020-09-01 Monthly Exchange Rate Pesos
```

## 2. Operations in ATMs

Series with the number of operations in ATMs with Debit and Credit Cards.

```

serie_atm <- c("SF62270", "SF62271")
name_atm <- c("with Debit Card", "with Credit Card")
title_atm <- "Operations in ATMs"
my_y <- "Number of operations"
my_x <- "Quarter"

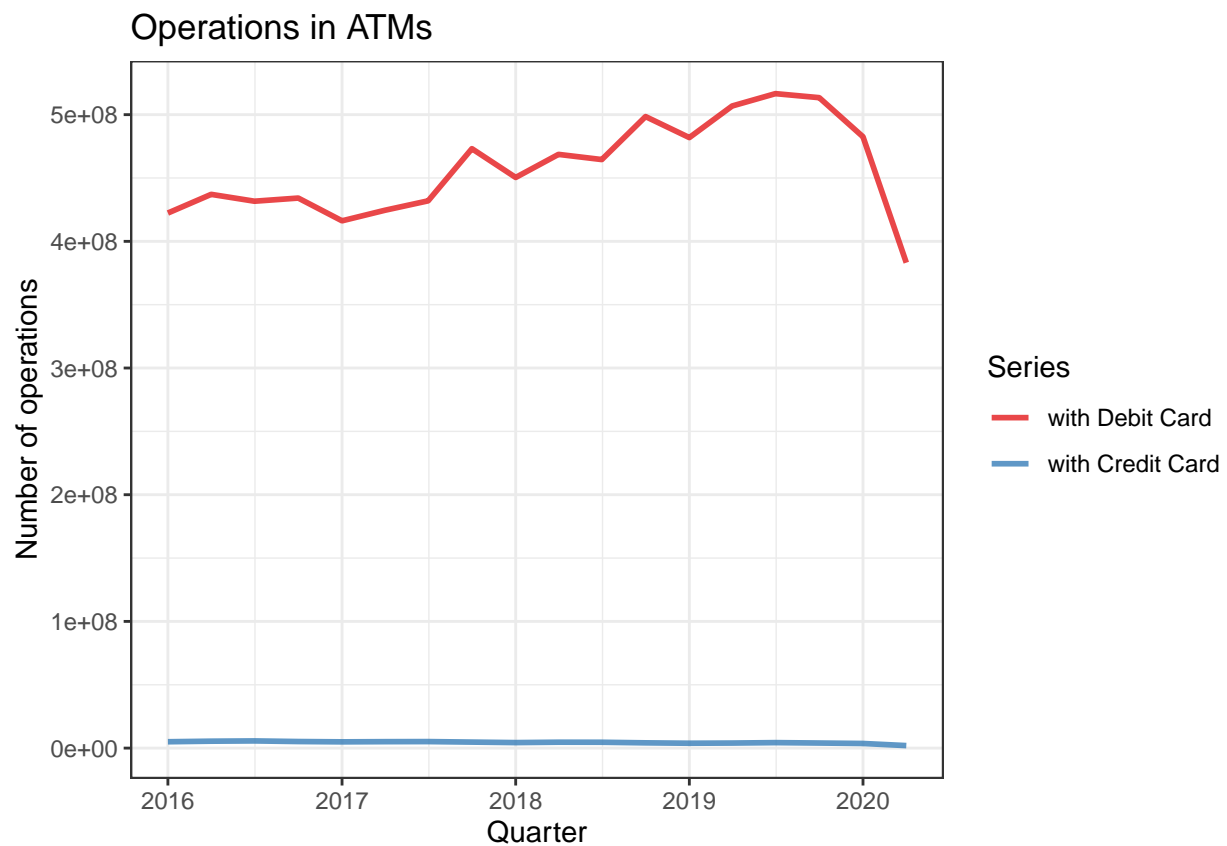
```

```

# run the function
df_atm <- sie_function(serie_atm, name_atm,
  title_atm, route="../img/",
  y_lab = my_y, x_lab = my_x)

```

## Saving 6.5 x 4.5 in image



```

## idSerie
## 1 SF62271
## 2 SF62270
##
## 1 Retail payment systems Transactions in ATMs Total transactions with credit cards Number of operations
## 2 Retail payment systems Transactions in ATMs Total transactions with debit cards Number of operations
## startDate endDate frequency dataType unit
## 1 2002-01-01 2020-04-01 Quarterly Volume Without units
## 2 2002-01-01 2020-04-01 Quarterly Volume Without units

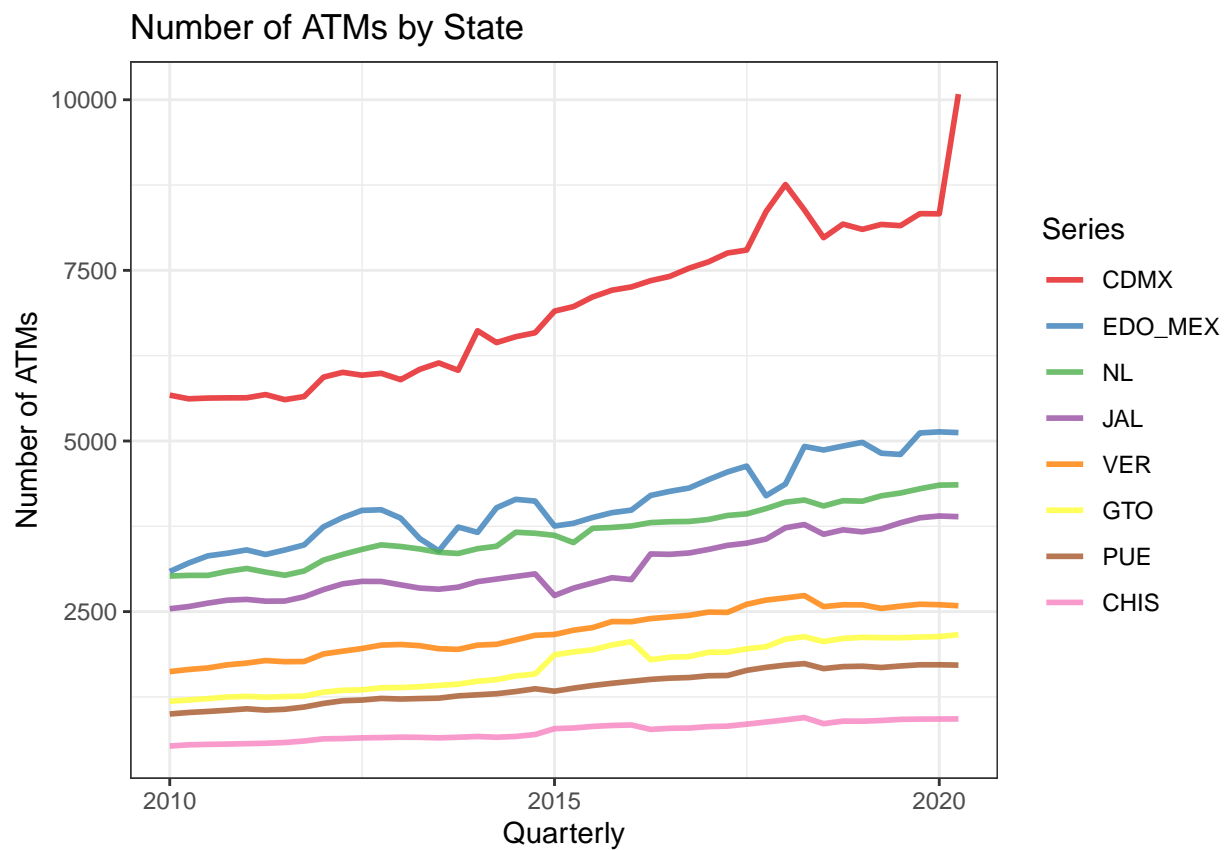
```

### 3. Number of ATM for the most populated States

Quarterly time series of the number of ATMs by State, for the 8 states more populated in Mexico, since 2010.

```
serie_state <- c("SF42310", "SF42338", "SF42346", "SF42336",  
                "SF42368", "SF42330", "SF42350", "SF42324")  
name_state <- c("CDMX", "EDO_MEX", "NL", "JAL", "VER",  
               "GTO", "PUE", "CHIS")  
title_state <- "Number of ATMs by State"  
my_start <- '2010-01-01'  
my_y <- "Number of ATMs"  
my_x <- "Quarterly"  
  
# run the function  
df_state <- sie_function(serie_state, name_state,  
                        title_state, route="../img/",  
                        y_lab = my_y, x_lab = my_x,  
                        startDate=my_start)
```

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```
## idSerie  
## 1 SF42330  
## 2 SF42310
```

```

## 3 SF42346
## 4 SF42368
## 5 SF42324
## 6 SF42338
## 7 SF42336
## 8 SF42350
##
## title
## 1 Retail payment systems Number of ATMs by State Total in Guanajuato
## 2 Retail payment systems Number of ATMs by State Total in Distrito Federal
## 3 Retail payment systems Number of ATMs by State Total in Nuevo León
## 4 Retail payment systems Number of ATMs by State Total in Veracruz
## 5 Retail payment systems Number of ATMs by State Total in Chiapas
## 6 Retail payment systems Number of ATMs by State Total in Estado de México
## 7 Retail payment systems Number of ATMs by State Total in Jalisco
## 8 Retail payment systems Number of ATMs by State Total in Puebla
## startDate endDate frequency dataType unit
## 1 2002-01-01 2020-04-01 Quarterly ciphers without type Without units
## 2 2002-01-01 2020-04-01 Quarterly ciphers without type Without units
## 3 2002-01-01 2020-04-01 Quarterly ciphers without type Without units
## 4 2002-01-01 2020-04-01 Quarterly ciphers without type Without units
## 5 2002-01-01 2020-04-01 Quarterly ciphers without type Without units
## 6 2002-01-01 2020-04-01 Quarterly ciphers without type Without units
## 7 2002-01-01 2020-04-01 Quarterly ciphers without type Without units
## 8 2002-01-01 2020-04-01 Quarterly ciphers without type Without units

```

#### 4. Retail payment systems transactions

Information from retail payments at ATMs, Points of Sales (POS), Checks, and Transfers by Electronic Payments, Internet Banking and Phone, from 2016 to 2019.

```

serie_trans <- c("SF62275", "SF62278", "SF61610", "SF60841",
                 "SF60842", "SF60843")
name_trans <- c("ATM", "POS", "Check",
                "Transfer by Electronic Banking",
                "Transfer by Internet Banking",
                "Transfer by Phone")
title_trans <- "Retail Transactions"
my_y <- "Millions of Pesos"
my_x <- "Quarterly"
my_start <- '2016-01-01'
my_end <- '2019-12-31'

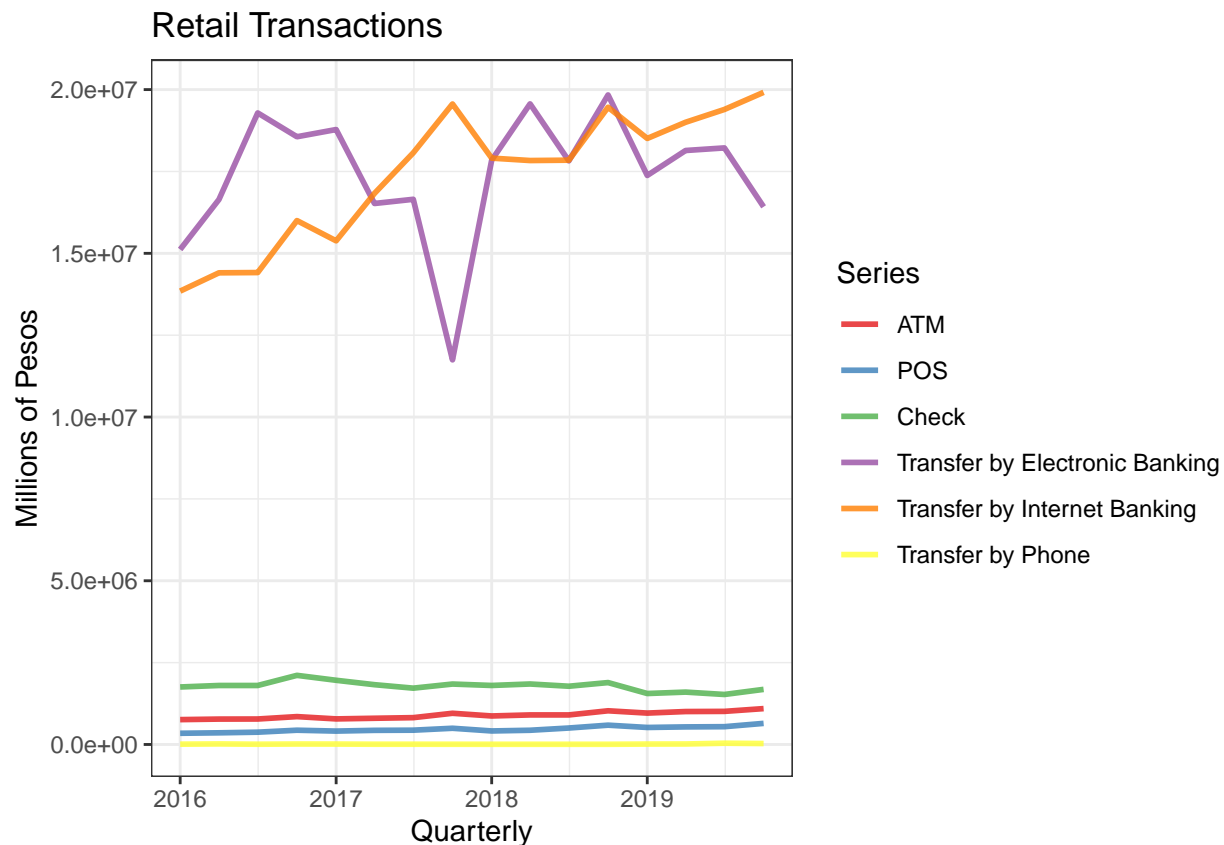
```

```

# run the function
df_trans <- sie_function(serie_trans, name_trans,
                         title_trans, route="../img/",
                         y_lab = my_y, x_lab = my_x,
                         startDate=my_start, endDate=my_end)

```

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```
##      idSerie                                     title
## 1 SF60843      Retail payment systems Operations by phone Total Amount
## 2 SF61610      Retail payment systems Total checks in local currency Amount
## 3 SF62278      Retail payment systems Operations in POS Total transactions Amount
## 4 SF60841      Retail payment systems Operations by electronic banking Total Amount
## 5 SF60842      Retail payment systems Operations by Internet banking Total Amount
## 6 SF62275      Retail payment systems Transactions in ATMs Total transactions Amount
##      startDate   endDate frequency      dataType      unit
## 1 2002-01-01 2020-04-01 Quarterly Accumulated flows Millions of Pesos
## 2 2002-01-01 2020-04-01 Quarterly Accumulated flows Millions of Pesos
## 3 2002-01-01 2020-04-01 Quarterly Accumulated flows Millions of Pesos
## 4 2002-01-01 2020-04-01 Quarterly Accumulated flows Millions of Pesos
## 5 2002-01-01 2020-04-01 Quarterly Accumulated flows Millions of Pesos
## 6 2002-01-01 2020-04-01 Quarterly Accumulated flows Millions of Pesos
```

## 5. Consumer Price Index (INPC)

Main time series of the Consumer Price Index (INPC for its acronym in Spanish), and their core and non-core subindexes. Time window of Enrique Peña Nieto's Presidency of Mexico (December 1, 2012 – November 30, 2018).

```
serie_inpc <- c("SP74625", "SP74626", "SP74628", "SP56337",
               "SP74631")
name_inpc <- c("INPC (main)", "Merchandise (sub, core)",
              "Services (sub, core)",
```

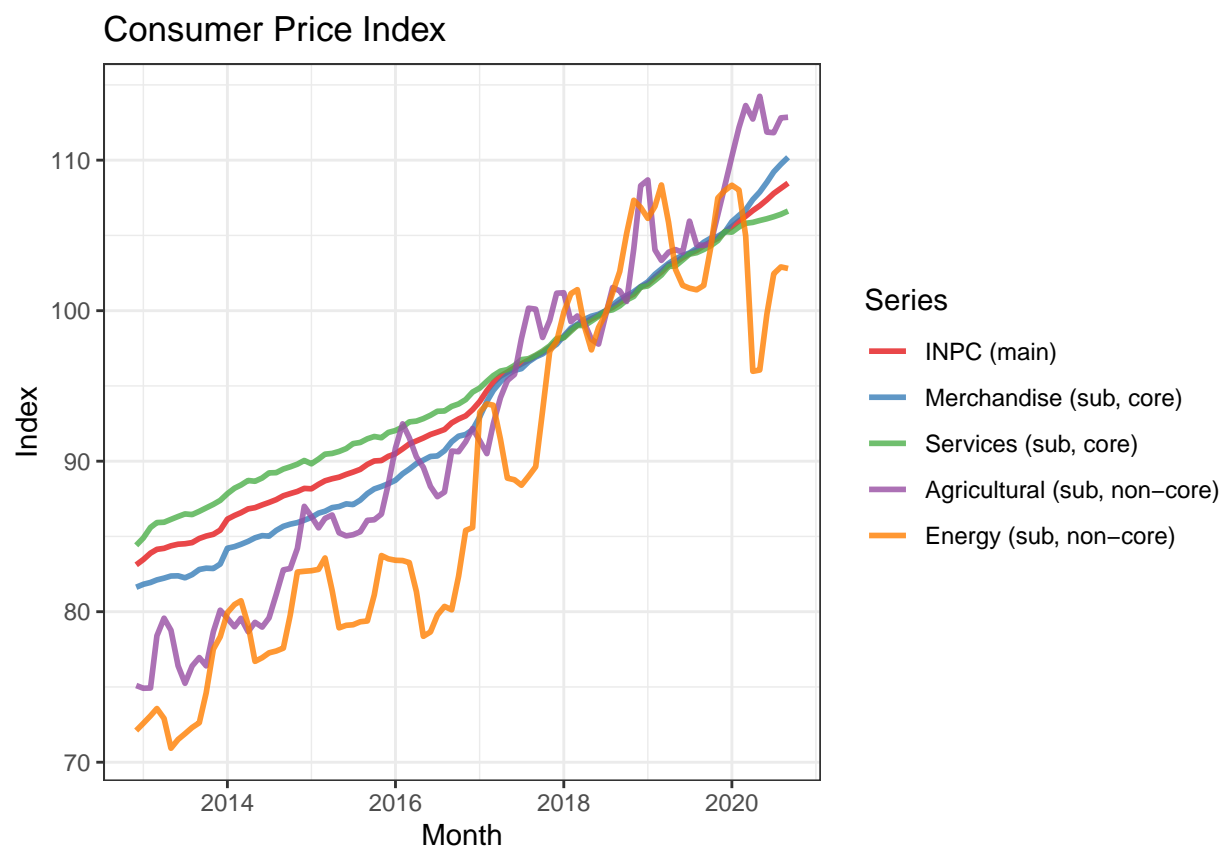
```

        "Agricultural (sub, non-core)",
        "Energy (sub, non-core)")
title_inpc <- "Consumer Price Index"
my_y <- "Index"
my_x <- "Month"
my_start <- '2012-12-01'
my_end <- '2018-11-30'

# run the function
df_inpc <- sie_function(serie_inpc, name_inpc,
                        title_inpc, route="../img/",
                        y_lab = my_y, x_lab = my_x,
                        startDate=my_start)

```

```
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```



```

## idSerie
## 1 SP74625
## 2 SP74631
## 3 SP74626
## 4 SP74628
## 5 SP56337
##
## 1

```

Core and complementary subindexes Consumer price index



```
## 2 Core and complementary subindexes Consumer price index (INPC) Non-Core Energy and Prices Approved I
## 3 Core and complementary subindexes Consumer price index (INPC) Cor
## 4 Core and complementary subindexes Consumer price index (INPC) (
## 5 Core and complementary subindexes Consumer price index (INPC) Non-Core
##   startDate   endDate frequency dataType      unit
## 1 1982-01-01 2020-09-01   Monthly   Indexes Without units
## 2 1982-01-01 2020-09-01   Monthly   Indexes Without units
## 3 1982-01-01 2020-09-01   Monthly   Indexes Without units
## 4 1982-01-01 2020-09-01   Monthly   Indexes Without units
## 5 1969-01-01 2020-09-01   Monthly   Indexes Without units
```

## 6. Twenty pesos comparison of Banknotes vs. Coins

In Mexico the 20 pesos banknote has coexisted with coin of the same denomination for more than twenty years. For this brief analysis, the idea is to compare the volumen of both type of cash for the 20 pesos denomination, since 2000.

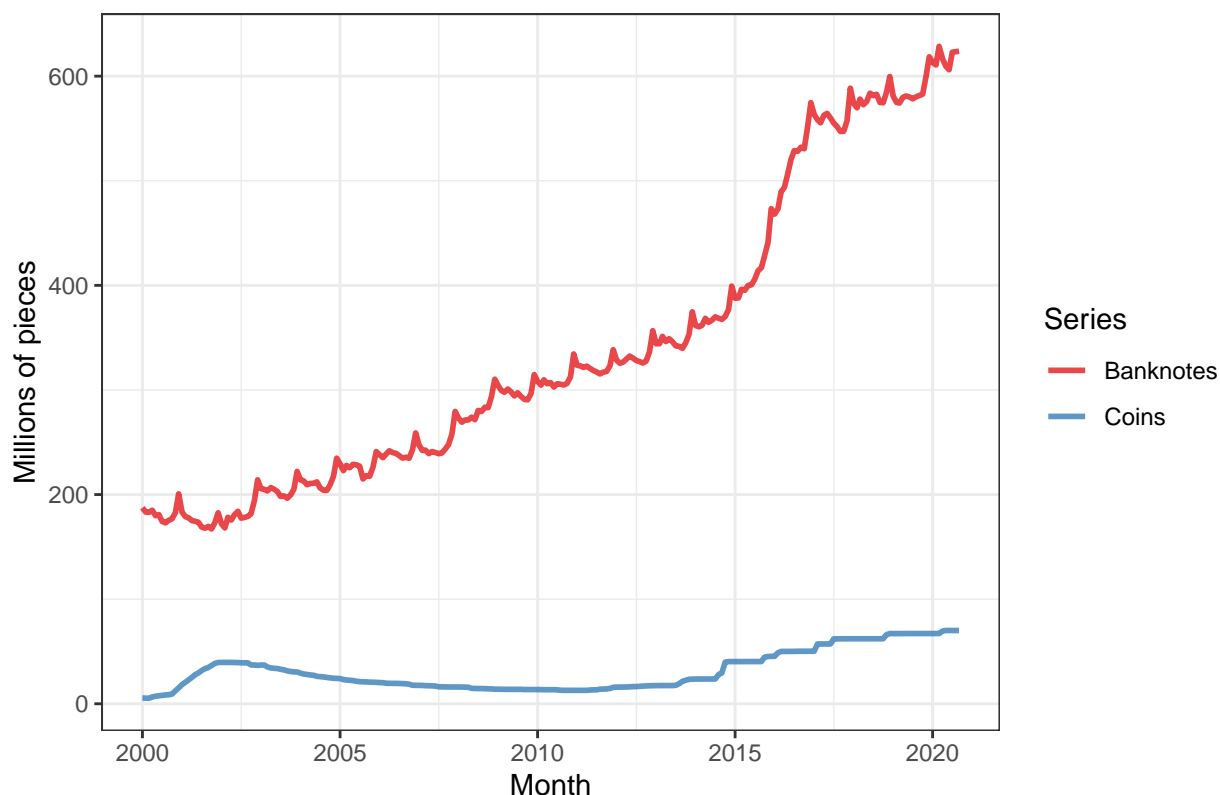
In general, while the **20 pesos banknotes** has been issued as a common monetary sign for daily payments, the Central Bank has used the **20 pesos coins** to issue commemorative events.

```
serie_twenty <- c("SM1472", "SM17")
name_twenty <- c("Banknotes", "Coins")
title_twenty <- "20 pesos Banknotes vs Coins"
my_y <- "Millions of pieces"
my_x <- "Month"
my_start <- '2000-01-01'

# run the function
df_twenty <- sie_function(serie_twenty, name_twenty,
  title_twenty, route="../img/",
  y_lab = my_y, x_lab = my_x,
  startDate=my_start)
```

```
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```

## 20 pesos Banknotes vs Coins



```
##   idSerie                                     title  startDate  endDate
## 1  SM1472 Total of banknotes in circulation 20 pesos 1993-01-01 2020-09-01
## 2   SM17              Coins in circulation 20 pesos 1999-01-01 2020-09-01
##   frequency dataType                        unit
## 1   Monthly   Stocks Millions of pieces
## 2   Monthly   Stocks Millions of pieces
```

## 7. Banknote lifetime

The banknotes have a life cycle similar to the humans: they get borned, have a life for certain time, and die. The lifetime of a banknote is the time that lapses from the point where it is delivered to a bank, until it is deposit as unfit banknote in the Central Bank.

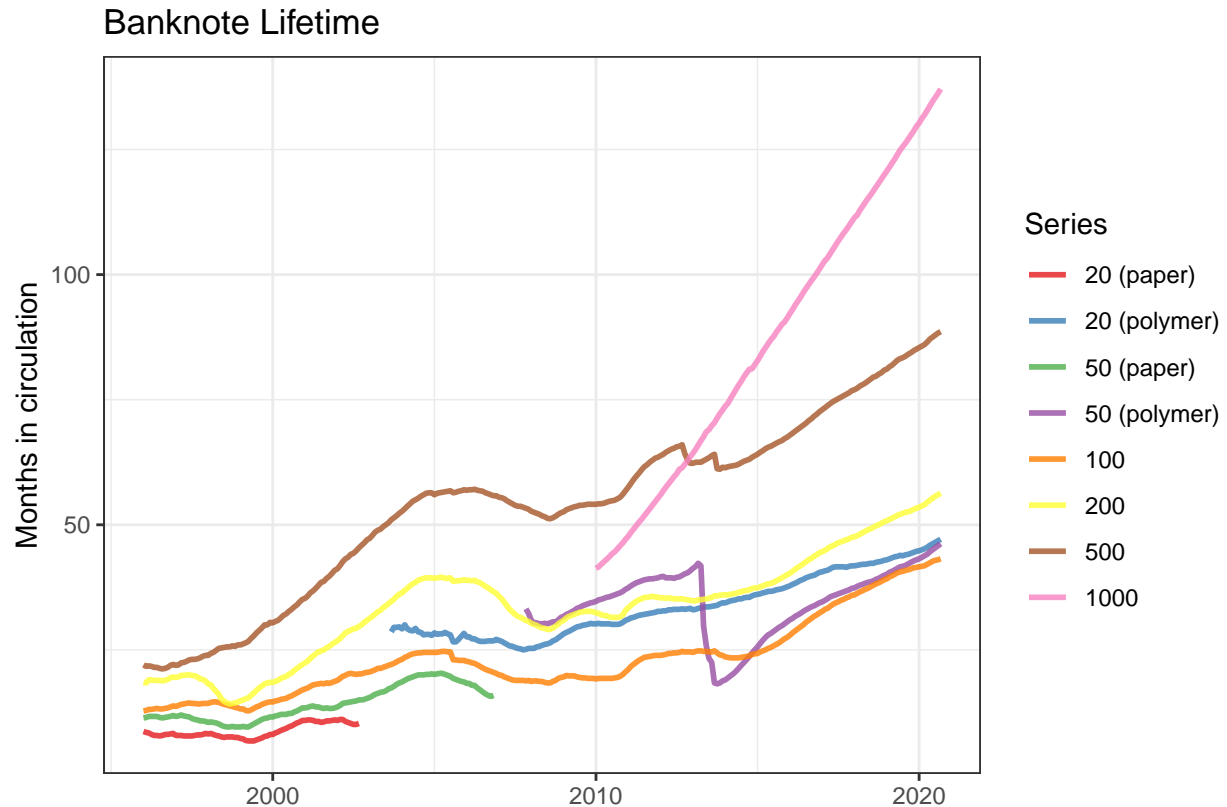
The aim of the next graph is to compare the lifetime of the different denomination Mexican Banknotes, since 1996. In the case of the lower denominations (20 and 50 pesos), at the beginning the substratum (material) of this denomination was paper-based, while it changed between 2003 and 2008 to polymer; both series are considerate in the plot.

```
serie_lifetime <- c("SM28", "SM29", "SM30", "SM60",
                   "SM31", "SM32", "SM33", "SM40")
name_lifetime <- c("20 (paper)", "20 (polymer)",
                  "50 (paper)", "50 (polymer)",
                  "100", "200", "500", "1000")
title_lifetime <- "Banknote Lifetime"
my_y <- "Months in circulation"
```

```
my_start <- '1996-01-01'

# run the function
df_lifetime <- sie_function(serie_lifetime,
  name_lifetime, title_lifetime,
  route="../img/", y_lab = my_y,
  startDate=my_start)
```

```
## Saving 6.5 x 4.5 in image
```



```
## idSerie title startDate endDate
## 1 SM31 Average banknote lifetime 100 pesos 1996-01-01 2020-09-01
## 2 SM40 Average banknote lifetime 1000 pesos 1996-01-01 2020-09-01
## 3 SM60 Average banknote lifetime 50 pesos (polymer) 1996-01-01 2020-09-01
## 4 SM32 Average banknote lifetime 200 pesos 1996-01-01 2020-09-01
## 5 SM29 Average banknote lifetime 20 pesos (polymer) 1996-01-01 2020-09-01
## 6 SM28 Average banknote lifetime 20 pesos 1996-01-01 2020-09-01
## 7 SM30 Average banknote lifetime 50 pesos 1996-01-01 2020-09-01
## 8 SM33 Average banknote lifetime 500 pesos 1996-01-01 2020-09-01
## frequency dataType unit
## 1 Monthly ciphers without type Months in circulation
## 2 Monthly ciphers without type Months in circulation
## 3 Monthly ciphers without type Months in circulation
## 4 Monthly ciphers without type Months in circulation
```

```
## 5   Monthly ciphers without type Months in circulation
## 6   Monthly ciphers without type Months in circulation
## 7   Monthly ciphers without type Months in circulation
## 8   Monthly ciphers without type Months in circulation
```

## 8. Remembrance of banknote security features

Each quarter of the year the Cash Area of the Central Bank conducts a national poll with different topics related with Coins and Banknotes<sup>1</sup>.

Among the information obtained in this polls, the Central Bank studies the percentage of people that remember two or more security features, and that check for the authenticity of their banknotes. As well, the aim of this example is compare to look into the previously mentioned timeseries, since 2010.

```
serie_perception <- c("SM69", "SM70")
name_perception <- c("Remember 2+ security features",
                    "Review authenticity of banknotes")
title_perception <- "Remembrance of Banknote Security Features"
my_y <- "Percentage of people (%)"
my_x <- "Quarter"
my_start <- '2010-01-01'

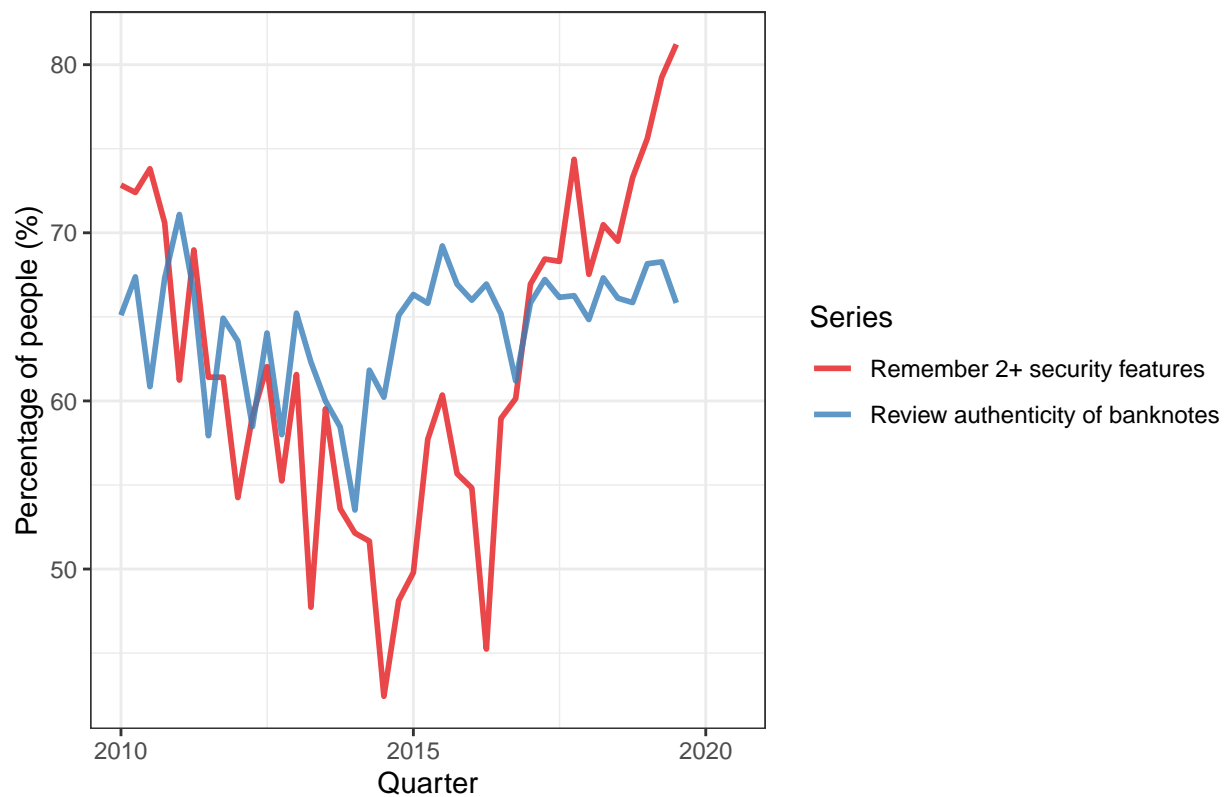
# run the function
df_perception <- sie_function(serie_perception, name_perception,
                             title_perception, route="./img/",
                             y_lab = my_y, x_lab = my_x,
                             startDate=my_start)
```

## Saving 6.5 x 4.5 in image

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<sup>1</sup>1. For more information look at this link, with the results of the different Qualitative (as focus groups) and Quantitaves studies (as polls). Warning: the information related with this studies is only available in Spanish language

## Remembrance of Banknote Security Features



```
## idSerie
## 1 SM70
## 2 SM69
##
## 1 Indicators of public perception of banknotes (quarterly data) Percent of people mentioning
## 2 Indicators of public perception of banknotes (quarterly data) Percent of people that remember or know
## startDate endDate frequency dataType unit
## 1 2008-07-01 2020-07-01 Quarterly Percentages Percentages
## 2 2008-07-01 2020-07-01 Quarterly Percentages Percentages
```

## 9. Mexican Public Sector Revenues vs Expenditures

Banco de Mexico publishes the Public Finances with detail of the accumulated flows of Revenues and Expenditures in the year, which is showed in the next example, with information for 2019.

```
serie_public <- c("SG46", "SG9")
name_public <- c("Total Expenditure", "Total Revenues")
title_public <- "Accumulated flows of Public Sector Finances in 2019"
my_y <- "Millions of Pesos"
my_x <- "Month"
my_start <- '2019-01-01'
my_end <- '2019-12-31'

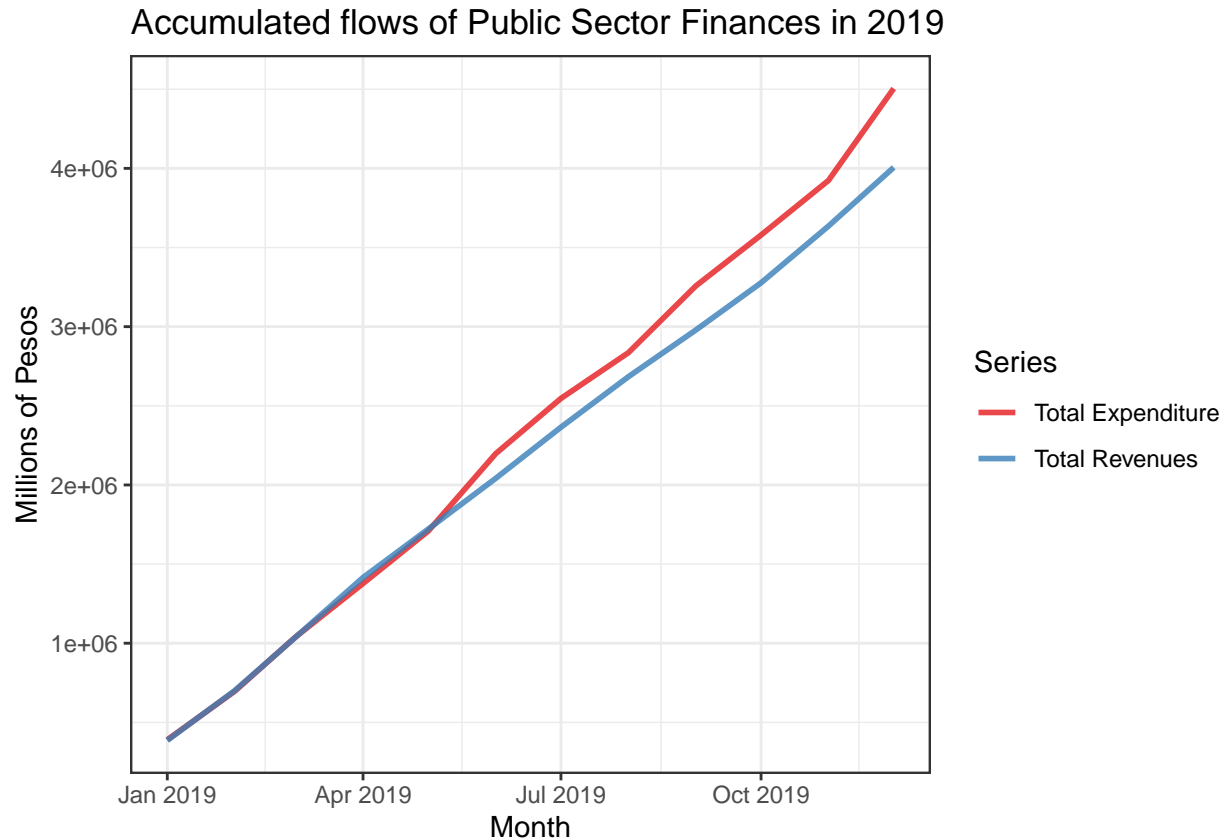
# run the function
df_public <- sie_function(serie_public, name_public,
```

```

title_public, route="../img/",
y_lab = my_y, x_lab = my_x,
startDate=my_start, endDate=my_end)

```

```
## Saving 6.5 x 4.5 in image
```



```

## idSerie
## 1 SG9
## 2 SG46
##
## 1 Revenues and Expenditures of the Federal Government Accumulated monthly figures Total Revenues
## 2 Revenues and Expenditures of the Federal Government Accumulated monthly figures Total Expenditure
## startDate endDate frequency dataType unit
## 1 1977-01-01 2020-08-01 Monthly Accumulated flows Millions of Pesos
## 2 1977-01-01 2020-08-01 Monthly Accumulated flows Millions of Pesos

```

## Final Comments

With this examples I have tried to explain the use of the customized function `sie_function` that take advantage of the utility functions from the R-package `siebanxicor` developed by Banco de Mexico to help developers, analysts and researchers to retrieve and analyze information published by the Central Bank in the Economy Information System (SIE).

I just want to remember the users of this notebook that the views and conclusions presented in this notebook and also in the repository, are exclusively the responsibility of the author and do not necessarily reflect those of Banco de México.

If you have any question related with this notebook and/or repository, please feel free to drop me a line by email.