The challenges and compilation of national accounts under a high inflation regime 'Argentina's case'

Pre-Conference Workshop of the 37th CIRET conference



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Agenda



- Argentina's general CPI
- International standards
- Argentina's case
- Methods
- Argentina's GDP
- Example
- **Financial Statements**
- Changes in stocks and holding gains
- Institutional sector accounts: Banks



What does this number represent? 26.790,0 ARS? USDP It's GDP 2023 implicit deflator!







From December 2016, Argentina's CPI increased by 183% in 3 years and around 6.500% in 7.5 years.



Argentina's General CPI level and monthly % change, 2017-2022



National accounts under conditions of high inflation

The Inflation Accounting. A Manual on National Accounting Under Conditions of High Inflation, prepared by Peter Hill in 1996, is grounded in the principles of the 1993 System of National Accounts (SNA 1993).

Country with high inflation: "Any country whose **general price level more than doubles in the course of a year.**"

Two of the main recommendations of that Manual are:

- 1. Compile national accounts for periods shorter than one year.
- 2. Devote the available resources to produce reliable estimates of the main aggregates rather than to try to produce a complete set of accounts which may be biased.



Central problem

When there is high inflation, flows towards the end of a year are **valued at much higher prices** than those at the beginning.

Data problems

The compilation of satisfactory accounts under high inflation is more complicated and **needs more information** than when inflation is low.

High inflation **requires the year to be divided into sub-periods** which are as short as possible in order to minimize the price variation within each sub-period.

The rapid changes in prices under high inflation also make it **difficult to obtain reliable data**.



National accounts under conditions of high inflation

Some of the main consequences of high inflation are:

✓ The economic significance of the relative prices of the same product at different points of time within the same accounting period have nothing to do with opportunity costs or utilities to users.

✓ It is not generally possible to partition changes in annual values into price and quantity components.

Annual quantity indices should not be derived by deflating annual current values by conventional price indices.

✓ Production accounts must be compiled at least quarterly and preferable monthly.

✓ The nominal holding gains on work-in-progress may easily be much greater than the value added. If the rules are not, or cannot be, followed the resulting accounts may be completely worthless and highly misleading.



Argentina's case

In several periods during the last decades, Argentina suffered episodes of high inflation and hyperinflation

In this presentation, we will focus on two key challenges posed by inflation within Argentina's national accounts, as well as the strategies employed to address these challenges effectively:

1. In the production account at constant prices

2. In the treatment of the financial statements of financial and nonfinancial companies that are adjusted for inflation in accordance with accounting standards



1. Production accounts at constant prices: Volume indicators

Two broad groups of methods are identified to obtain volume measurements :

- 1. **Deflation:** The estimate at current prices is divided by a price index to calculate the estimate at constant prices. This price index can be IPP, CPI, XPI, MPI, etc.
- 2. Volume extrapolation: the current value of the base year is updated using a volume index (made from outputs or inputs). Volume indices take into account both changes in quantity and quality.

The international guidelines state that...

With the exception a situation of hyperinflation, or for products showing rapid quality change (e.g. personal computers) deflation can be expected to give more accurate results than volume extrapolation, since the variance in relative prices for a product in a particular month are usually less than the variance in relatives quantities.



1. Production accounts at constant prices: Volume indicators

In case no deflation can be applied there are several specific methods at the compiler's disposal based on volume extrapolation such as:

✓ **Output indicator method:** relates to direct measurement of the volume of output. Where there are very homogeneous products without large quality changes and where detailed quantity information is available, it can be equivalent to price deflation.

Secondary indicators: are indicators not directly related to the output, used as proxies in cases where there are no indicators for target variables. E.g., supply of building materials can be used as an indicator of construction activity.

✓ Input indicator methods: when indicators on the volume of inputs (e.g., the number of employees or the volume change of intermediate inputs) are used to approximate the volume of output. With this method it impossible to analyse changes in productivity.



1. Production accounts at constant prices: Volume indicators

In Argentina's national accounts, the measurement of value added at constant prices predominantly relies on volume extrapolation, accounting **for 89% of the total**, using various alternative methods. Only 11% of the value added is estimated through the process of deflation.

This pattern is consistent across multiple indicators produced by INDEC, which are essential sources for compiling the national accounts.

For example, in the **Industrial Production Index (IPI) for manufacturing activities, approximately 68% of the industry's value added is measured using a volume or quantity indices**. This includes metrics like output in physical units, sales in physical units, inputs in physical units, and hours worked by personnel, among others. The remaining 32% is measured using deflation methods, specifically deflated sales, where quantity-based extrapolation is not feasible due to the heterogeneity of the products.



Production accounts at constant prices: Volume indicators

Γ	Activity ISIC Rev. 3	Estimation Method	Indicador Examples				
A	Agriculture, hunting and forestry	Extrapolation	Hectares planted, Harvested area, Crop production (tons)				
В	Fishing	Extrapolation	Fish production (tons)				
С	Mining and quarrying	Extrapolation	IPI				
D	Manufacturing	Extrapolation and Deflation	Extrapolation with IPI, deflation with PPI				
E	Electricity, gas and water supply	Extrapolation	Generation (MWh), Gas production/distribution (m3), Water production (m3)				
F	Construction	Extrapolation	ISAC (apparent consumption of inputs), Jobs				
G	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	Extrapolation	Number of vehicles. Commodity flow: expo and impo volumes, constant margins, sales to the domestic market.				
н	Hotels and restaurants	Extrapolation	Bed nights, Jobs				
I	Transport, storage and communications	Extrapolation	Passenger/km, Cargo/km				
J	Financial intermediation						
	Banks and Activities auxiliary	Deflation	СРІ				
	Insurance	Extrapolation	Number of insurance policies, Jobs				
к	Real estate, renting and business activities	Mainly Extrapolation Deflation (advertising)	Building permits, Number of deeds, Output volume indicators for transport and construction activities, Notarial acts, No. of legalizations				
L	Public administration and defence; compulsory socia	Extrapolation	Number jobs for nation, provinces and municipalities.				
Μ	Education	Extrapolation	Jobs				
Ν	Health and social work	Extrapolation	Jobs				
0	Other community, social and personal service activit	Extrapolation	Jobs and other quantity indicators				
Ρ	Activities of private households as employers and undifferentiated production activities of private households	Extrapolation	Jobs				



During the first half of 2018, various macroeconomic factors led to a sharp acceleration in inflation, with cumulative levels surpassing 100% over three years. As a result, the Argentine Federation of Professional Councils of Economic Sciences (FACPCE) mandated the initiation of inflation adjustment in line with International Accounting Standard No. 29 (IAS 29) 'Financial Reporting in Hyperinflationary Economies.' The decision on the effective date for this adjustment was delegated to the regulatory bodies.

IAS 29 outlines several criteria for classifying an economy as hyperinflationary, including: "the cumulative inflation rate over three years approaches, or exceeds, 100%."

From 2018 onwards, non-financial companies were required to present their financial statements adjusted for inflation: Each non-monetary transaction needed to be restated using the CPI index at the end of the accounting period.

For the financial sector, this inflation adjustment to financial statements became applicable starting in 2020.



Transactions, such as sales, are adjusted using the CPI index as of the reporting date, ensuring that all figures in the financial statements are expressed in terms of December prices.





The National Survey of Large Enterprises (ENGE), one of the data sources for the corporate sector, collects annual data at current prices and data from the companies' balance sheets.

As from the closing of the 2018 business year, corporate data are inflation-adjusted by the application of the CPI indices. To obtain current prices data that can be used in the national accounts, it is necessary to carry out the reverse process.

Given that the values surveyed are annual, the company is requested to provide complementary monthly data at nominal values (unadjusted for inflation) referring to the months of the commercial year.

Information from the monthly nominal data annex:

- Sales: primary activity, industrial, construction, electricity, gas and water, commercial, services.
- Purchases of raw materials and goods for resale.
- Fixed assets and intangibles: additions of own production, additions of acquired goods and sales.
- Interest and dividends.
- Salaries and compensation.



The National Survey of Large Enterprises (ENGE) Questionnaire

Manata a function Magandian Manata a function Ma				Annual Data						No	Montl ominal	nly Data							
ENCUESTA NACIONAL A GRANDES EMPRESAS 2023											Anne	ex							
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LEY N°17.522 Articuto 10: Las informacion Estadístico Nacional, en cum utilizarán con fines estadil compliaciones de conjunto, d ni individualizarse las perso secreto estadístico tes sinois		1. INGRESOS DEVENGADOS POR LAS ACTIVIDADES REALIZADAS EN LA EMPRESA DURANTE EL AÑO 2022							Argentina										
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		1.1.4 Actividad de generación de Electricidad y capitación y	1		2				(Art. 10 de la Ley N° 17.622).										
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4 Razón Social: 1.20 VENTA DE MERCADERÍAS EN EL MISMO ESTADO EN DIE ELEPONA ADDUBIDAS.						3 0		ENGE 2024											
5 Calle/Ruta:		1.2.1 Recibidas de locales productores de la empresa, para											SOLICITUD DE DAT						
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14.0 REPARACIONES DE MAQUINARIAS Y EQUIPOS QUE 1 PERTENECEN A TERCEROS 1						s 0			EMPRESA Nº										
13 Departamento o Partido:		1.5.0 COMISIONES POR LA INTERMEDIACIÓN EN LA			11				CIERRE DEL EJERCICIO:						CARGAR FECHA DE CIERRE EN FORMATO déiministes				
14 Provincia:		COMPRA O VENTA DE MERCADERÍAS Y/O SERVICIOS	1			5 0													
15 Forma Jurídica:		1.6.0 PRESTACIONES DE SERVICIOS PARA TERCEROS Y/O PARA OTROS LOCALES DE LA EMPRESA	1		2		s 0	DATOS DEL PERIODO EN PESOS A VALORES HISTORICOS (sin ajusta por inflación):											
16 Fecha de iniciación de actividades de la empresa:	Año:	17.0 DISTRIBUCIÓN DE ELECTRICIDAD Y GAS	1		H		3 0		VENTAS BIENES DE C							E CAMBIO			
17 Fecha de cierre del	Mes:	1.8.0 REGALIAS POR USO DE MARCAS, PATENTES, Y	++-		ł I				MESES		LOCALES	LOCALES	LOCALES	LOCALES	LOCALES	LOCALES	COMPRAS DE	COMPRAS DE	
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19 Nombre del Grupo		1.9.1 Arrendamiento de campos	1		11	1			enero-2023					L					
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económica principal		1.10.2 SUBSIDIOS DE CAPITAL	1		11		3 0		junio-2023										
		1.11.1 INTERESES CON EL SISTEMA FINANCIERO	1		11		3 0		julio-2023	-									
		1.11.2 OTROS INTERESES	1		11		3 0		acceto-2023										
		1.12.0 DIVIDENDOS	1		11	1	3 0		septembre 2023										
		1.13.0 OTROS INGRESOS OPERATIVOS	1		11	1	3 0		octubre-2023										
		1.14.0 SUBTOTAL INGRESOS	1	0	2	0	3 6		noviembre-2023										
		1.15.0 INGRESOS EXTRAORDINARIOS	1		\vdash		3 0		diciembre-2023										
		1.16.0 TOTAL INGRESOS	1		2	0	3 6		TOTALES										
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Link to the Annex



ENGE needs to revert the inflation adjusted process used in the reporting of surveys and financial statements.





Steps for the calculation of inflation adjustment coefficients:

1. Calculate the inflation-adjusted monthly values (based on the nominal monthly values reported in the Monthly Nominal Data Annex).

$$X_{ij} = \frac{CPI_{12}}{CPI_i} * X_{ij}$$

2. Calculate the annual totals for both inflation-adjusted and nominal values.

$$X_j = \sum_{i=1}^{12} X_{ij}$$
; $Y_j = \sum_{i=1}^{12} Y_{ij}$

X_{ij}, = nominal value of variable X for company j in month i.

Y_{ij},= inflation-adjusted value.

$$I = 1,...,12$$

 $J = 1,...,N,$

3. Calculate the (annual) coefficients for each company.

$$F_{Xj} = \frac{Y_j}{X_j}$$



Steps for the calculation of inflation adjustment coefficients:

4. Calculate the weight for each ISIC division.

weight_division_j =
$$\frac{V_{jk}}{\sum_{j=1}^{J_k} V_{jk}}$$

5. Calculate the coefficients for each ISIC division.

$$Factor_division_k(X) = \sum_{j=1}^{J_k} weight_division_j * F_{Xj}$$

- 6. Calculate the weight for each ISIC section. (similar to step 4)
- 7. Calculate the coefficients for each ISIC section. (similar to step 5)

 V_{jk} = nominal value of sales of company j in division k.

Applying the method:

All inflation-adjusted variables of the <u>questionnaire (Form L)</u> are corrected by the inflation adjustment coefficients as follow:

- Income Chapter: Sales Coefficients
- Expenses Chapter:
- a. Salaries and wages, social security contributions and compensation: salary coefficient
- b. Intermediate consumption expenses: purchasing coefficient
- c. Raw materials consumption, Cost of goods for resale, and consumption materials: a different coefficient is applied to each component
 - a. Initial stock: end-to-end coefficient
 - b. Purchases: average purchase coefficient
 - c. Final stock: coefficient 1.



Applying the method:

- d. Amortization of fixed assets: average coefficient.
- e. Income tax: tax accrued in the year without adjustment.
- Inventory chapter:
- a. Stock at the beginning: an adjustment coefficient is applied to all initial stock from end to end.
- b. Stock at the end: no adjustments are applied since they are valued at market prices.
- c. Purchases of the year: the specific coefficient for purchases is applied.
- Fixed assets and intangibles chapter: coefficient of additions and sales of fixed assets and intangibles

<u>Questionnaire (Form E) – Enterprise</u>:

Assets and Liabilities chapter as of December 31: not deflated.



Changes in inventories and holding gains

Obtained the historical values, the next step is to calculate the output and intermediate consumption based on sales, purchases of goods and services, and changes in inventories.

- Changes in inventories calculated from <u>historical values tend to overestimate output and underestimate</u> <u>intermediate consumption</u> due to the holding gains realized while goods are kept in stock.
- ✓ Ideally, accurate measurement would require data on the quantities of goods entering and exiting inventories and their corresponding prices at those times.

✓ Since such data is unavailable, an alternative method is used: changes in stocks and holding gains are calculated by using the value of the opening and closing stocks of the year, adjusted with implicit price indices of output by economic activity.

The method involves rescaling the historical values of the opening and closing stocks to obtain <u>economic</u> <u>values</u>. This is done by applying a coefficient derived from the ratio between the average implicit price index of the year and the corresponding indices at the beginning and end of the year.



Estimates of changes in stocks and holding gains

The formulas used are the following:

$$Inv_{ev(t-1)} = Inv_{t-1} * IPI_{(avg)} / IPI_{(t-1)}$$
$$Inv_{ev(t)} = Inv_{t} * IPI_{(avg)} / IPI_{(t)}$$

Where:

Inv $_{ev(t-1)}$ = stock at the beginning at economic value.

Inv $_{ev(t)}$ = stock at the end at economic value.

 $Inv_{(t-1)}$ = stock at the beginning at historical values.

Inv $_{(t)}$ = stock at the end at historical values.

IPI $_{(avg)}$ = average implicit price index of output of the period, defined as the geometric average of the index of the second quarter of year $_{t}$ and the third quarter of year $_{t}$.

IPI $_{(t-1)}$ = implicit price index of output at the beginning of the period, defined as the geometric average of the index of the fourth quarter of year $_{t-1}$ and the first quarter of year $_{t}$.

IPI (t) = implicit price index of output at the end of the period, defined as the geometric average of the index of the fourth quarter of year $_{t}$ and the first quarter of year $_{t+1}$.

Estimates of changes in stocks and holding gains

The changes in inventories at economic value are given by:

 $CS_{ev} = Inv_{ev(t)} - Inv_{ev(t-1)}$

The difference between the historical values of changes in inventories minus the estimate of changes in inventories at economic value is the **holding gains** recorded in the revaluation account.

The following formulas are used:

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HG_{(t)} = [Inv_{t} - Inv_{t-1}] - [Inv_{ev(t)} - Inv_{ev(t-1)}]
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HG $_{(t)}$ = [Inv $_t$ - Inv $_{t-1}$] - CS $_{ev}$

Where:

HG (t) = holding gains for the period.



Thank you for your attention!



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National survey of large enterprises

"Warning to users: ... the Argentine Federation of Professional Councils of Economic Sciences (FACPCE) established, through Resolution 539/2018, that from the closings operated from July 1, 2018, the application of the adjustment for inflation should be resumed. Consequently, these measures may affect the economic aggregates presented in this report, because they are generated from the accounting information disclosed by the companies in the survey forms. The economic aggregates were generated in current currency, with information provided by the companies in historical currency, which differs from the balance sheets of the companies where the adjustment for inflation was applied. It should be noted that the profit measured by ENGE does not coincide with that arising from the balance sheets of companies, due to the treatment of the different items of expenses and income, as the results from holding gains, exchange rate differences, results from exposure to changes in the purchasing power of the currency (RECPAM) ... "

Grandes Empresas en Argentina 1993-2004



indec

National survey of large enterprises

7. Anexos

- 7.1. Clasificación Nacional de Actividades Económicas (ClaNAE)
- 7.2. Definición de indicadores
- 7.3. Tratamiento de la ENGE en un año con inflación
- 7.4. Ayuda del CD-ROM

"ENGE, which collects data from the balance sheets of companies, receives the information adjusted by the CPI at the closing date of the business year.

... it is necessary to measure and eliminate the bias generated in non-monetary accounting information by having made adjustments with the CPI.

In order to <u>measure and eliminate it</u>, non-monetary variables must be adjusted by the <u>correction coefficient</u> that arises from applying the CPI.

Since the values collected are annual, <u>weights must be identified</u> <u>that measure the monthly importance of the variables to be</u> <u>corrected in order to calculate a weighted index for measuring the</u> bias."

Institutional sector accounts: Banks



Methodological Adjustments:

"Accounting adjustment for inflation: Given the inflationary situation of the Argentine economy as of 2020, the financial statements of financial institutions must be presented adjusted for inflation according to accounting standards. This implies, for national accounts, that the figures that are adjusted for inflation must be returned to figures at current prices. In the case of depository institutions, except for the central bank, monthly information is available, so the flow at current prices is obtained as the difference between the value of the item in the period and the adjusted value of the item in the previous period; the adjusted value of the item in the previous period is obtained by multiplying by the coefficient that arises from the quotient between the CPI of the period and the CPI of the previous period. For the BCRA, the base data is annual and the value of transactions at current prices must be estimated by multiplying the flows by a coefficient, calculated as the ratio of the current year's annual average CPI to the CPI of December of the same year."

Institutional sector accounts: Banks



Cuentas por sectores institucionales Sector sociedades financieras

Subsectores banco central y sociedades de depósitos excepto el banco central Año 2022

Argentina

struto Nacional de tadiatica y Censos República Argentra **Conversion of the central bank's income statement to national accounts concepts** "Table 6 shows the statistical adjustments required to convert the concepts of net financial result and net result of the fiscal year from the BCRA financial statements to the macroeconomic aggregates of the 2008 SNA, the net primary income balance and net disposable income and net savings."

	Cuadro 6. Conversión de los saldos de estado de resultados del banco central a los conceptos de las cuentas nacionales, en millones de pesos. Años 2016-2022											
			Origen de la partida	2016	2017	2018	2019	2020	2021	2022		
	Resultado financiero neto (Ri	FN)	Estado de resultados BCRA	75.374	-58.000	585.813	1.620.533	1.169.417	156.832	1.434.779		
menos	Previsiones		Estado de resultados BCRA	-119	-168	91	-523	-928	-831	-291		
menos	Revalorizaciones		Estado de resultados BCRA	214.847	145.850	904.674	2.193.443	1.929.885	1.686.814	5.699.545		
menos	Otros ajustes al RFN		Estado de resultados BCRA	-15	-22	-30	-46	0	-228	-148		
menos	Ajuste por valuación a valores corrientes (2)		DNCN	0	0	0	0	-108.929	-241.240	-1.085.149		
igual	Saldo de ingresos primarios neto		DNCN	-139.339	-203.660	-318.922	-572.342	-650.612	-1.287.683	-3.179.178		
	Resultado neto del ejercicio-	Ganancia/(pérdida)	Estado de resultados BCRA	67.449	-66.978	576.910	1.606.982	522.558	-454.409	1.146.073		
menos	Previsiones		Estado de resultados BCRA	-179	-1.538	-357	-3.257	-4.102	-7.119	-8.288		
menos	Revalorizaciones		Estado de resultados BCRA	214.847	145.850	904.674	2.193.443	1.313.317	1.118.089	4.808.413		
menos	Otros ajustes al resultado neto	del ejercicio (1)	Estado de resultados BCRA	-91	749	-202	-837	-3.203	-7.200	676.335		
menos	Ajuste por valuación a valores o	corrientes (*)	DNCN	0	0	0	0	-109.436	-241.347	-1.084.961		
igual	Ingreso disponible neto/ahor	ro neto	DNCN	-147.129	-212.040	-327.204	-582.367	-674.017	-1.316.831	-3.245.425		

(¹) Se excluyen las comisiones netas. En 2022 se excluye la partida Compensación Patrimonial Programa de Incremento Exportador de la nota 4.23.11 del estado financiero del banco central.

(²) Corresponde al tratamiento estadístico de los valores en el estado financiero del banco central ajustados por inflación desde el año 2020.

