

Introduction to Inflation Indexes

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What is an Inflation Index

- An inflation index tracks the changes in the overall price level in an economy over time.
- The rate of inflation is simply a change in the inflation index from one point in time to the other.
- Videos:
 - Video 1: What is inflation [Credit: Guardian]
 - Video 2: House Price Index [Credit: Hoffmann Financial Group]
 - Video 3: SA CPI July 2026 [Credit: Stats SA]
 - Video 4: The Big Mac Index [Credit: Explainity]

What is an Inflation Index

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Types of Inflation Index

Consumer Price Index (CPI)

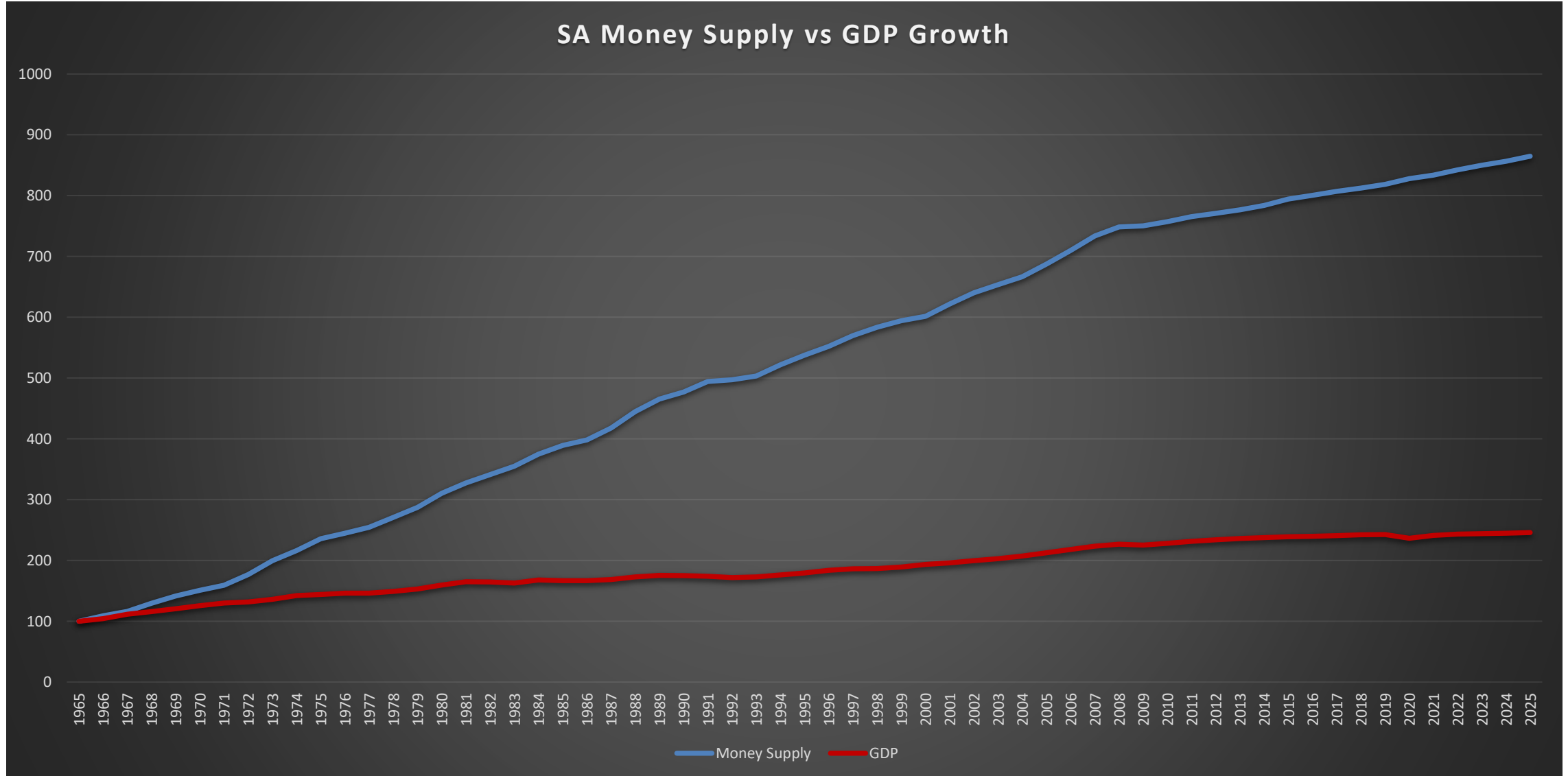
- The consumer price index is the most widely used inflation index. It tracks the prices that consumers pay for day-to-day living expenses.
- In South Africa, the CPI encompasses 12 categories of consumer expenses: Food and non-alcoholic beverages; Alcoholic beverages and tobacco; Clothing and footwear; Housing and utilities; Household contents; Equipment and maintenance; Health; Transport; Communication; Recreation and culture; Education; Restaurants and hotels.
- Variants of the CPI used in South Africa include the CPIX index; the Food Index and the Core Index.

Types of Inflation Index

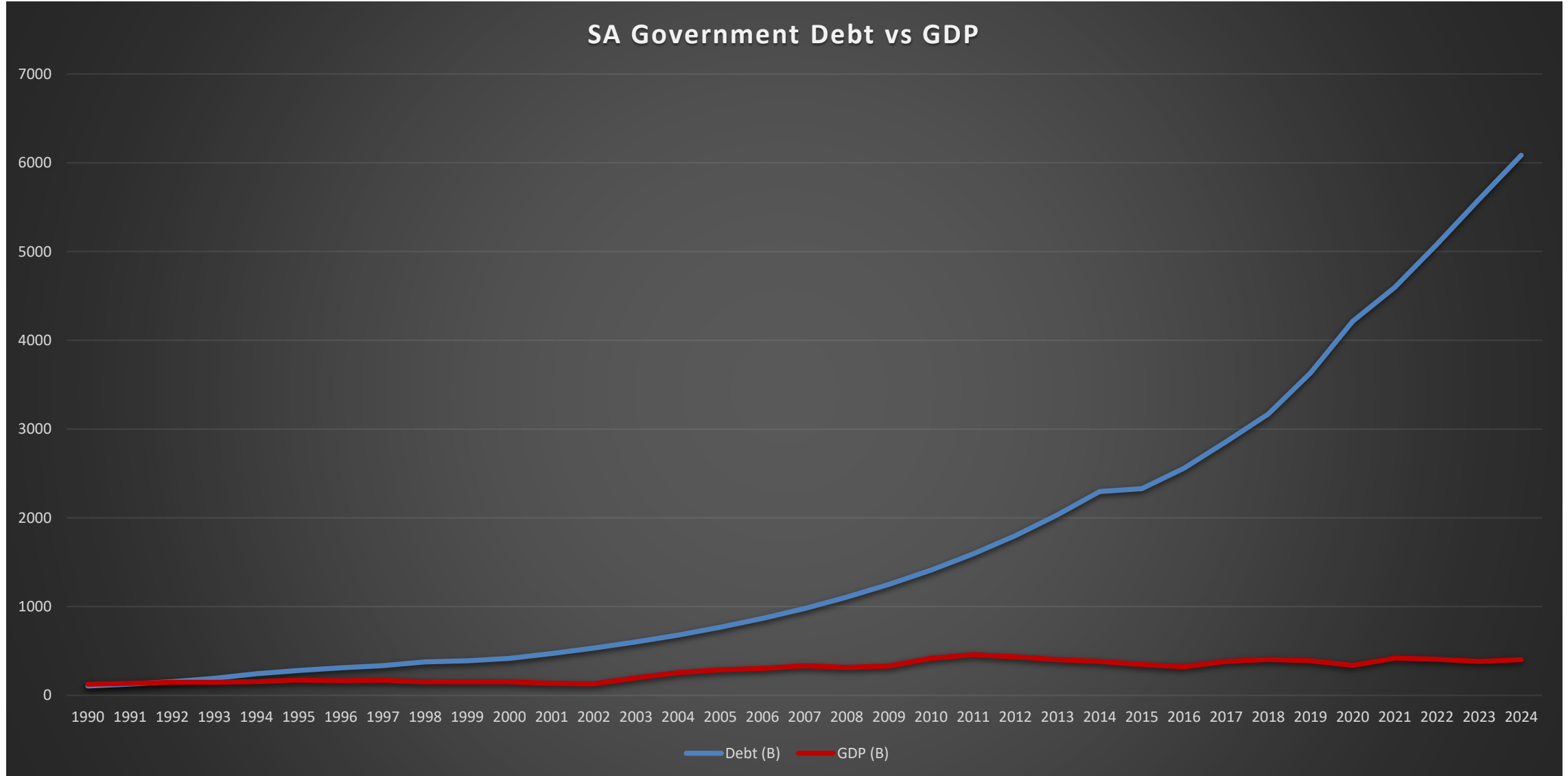
Producer Price Index (PPI)

- The PPI looks at the prices that producers pay and measures changes in the sale prices for the entire domestic market of raw goods and services.
- In South Africa, the PPI tracks the following categories of goods: Final manufactured goods; Intermediate manufactured goods; Electricity and water; Mining; Agriculture, Forestry and fishing.

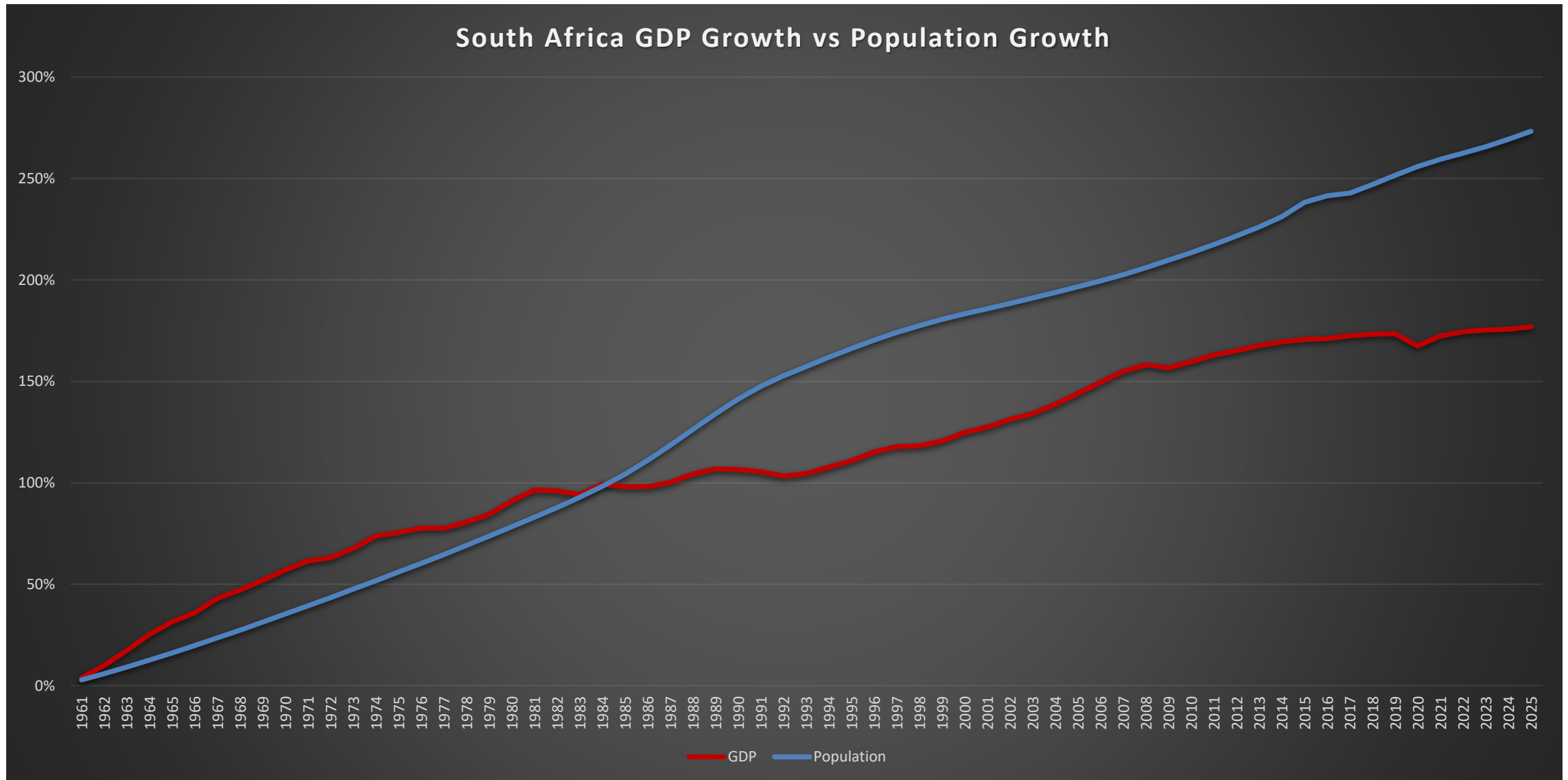
Drivers of Inflation



Drivers of Inflation

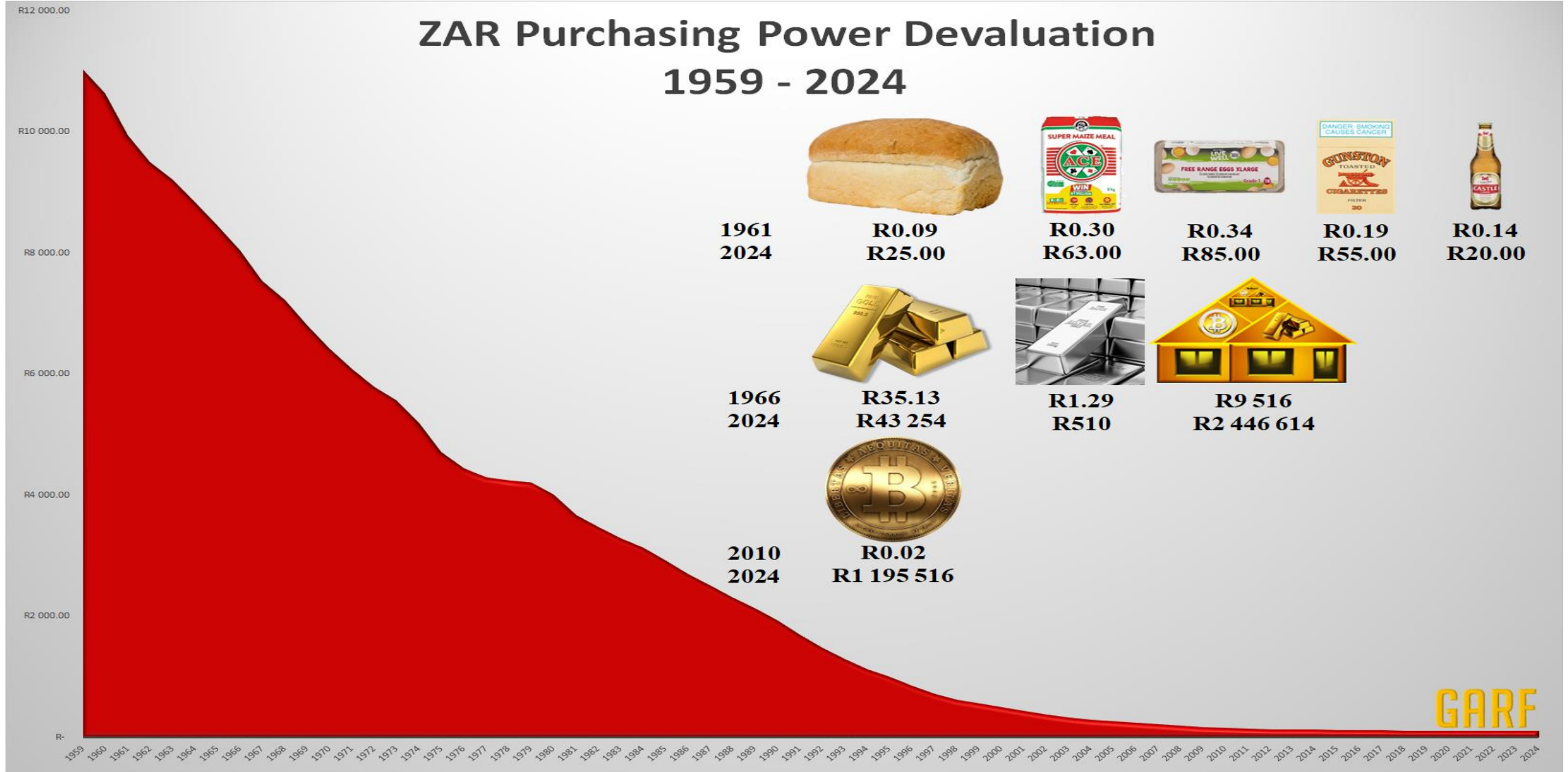


Drivers of Inflation



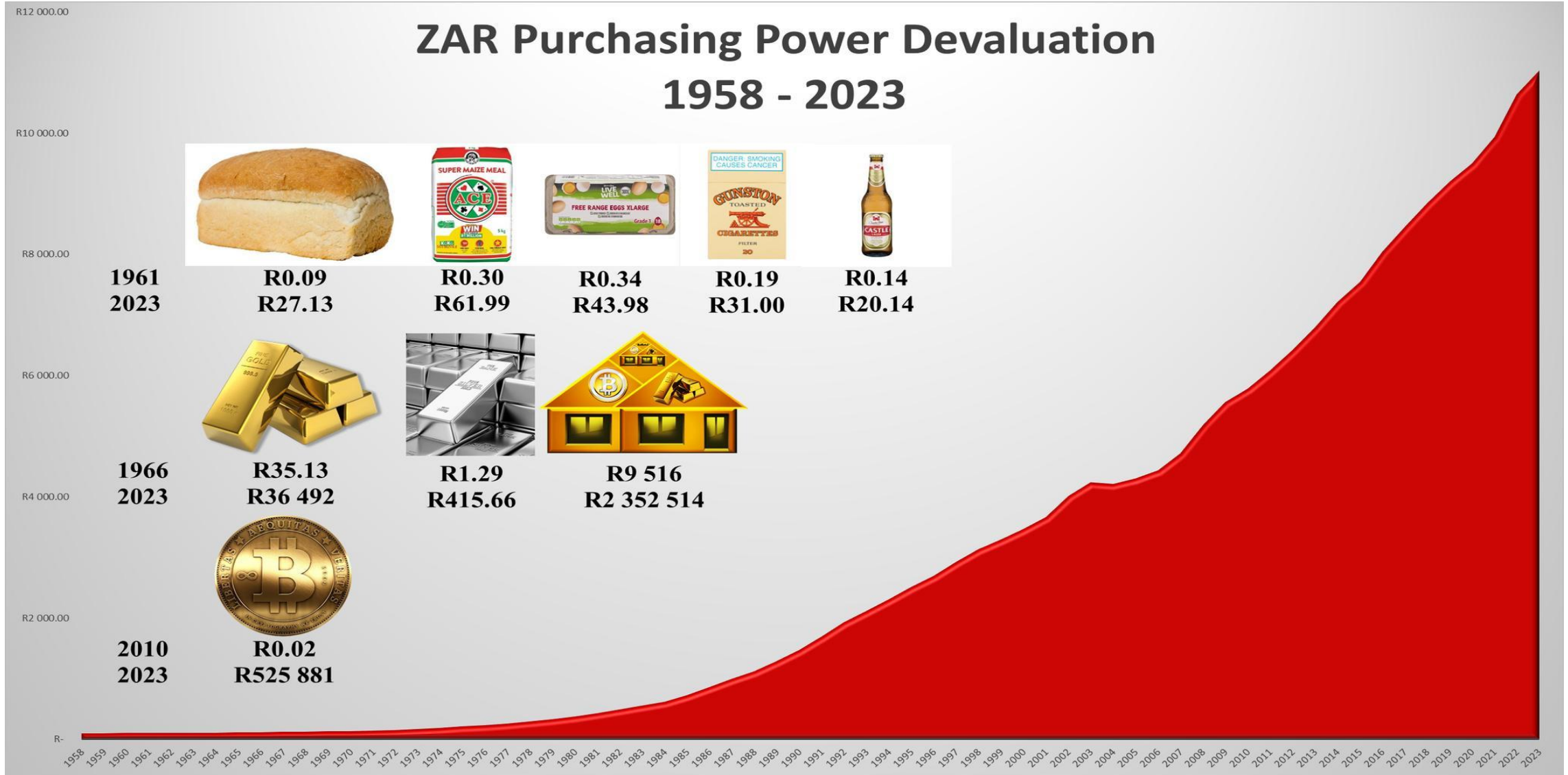
Effects of Inflation

ZAR Purchasing Power Devaluation 1959 - 2024

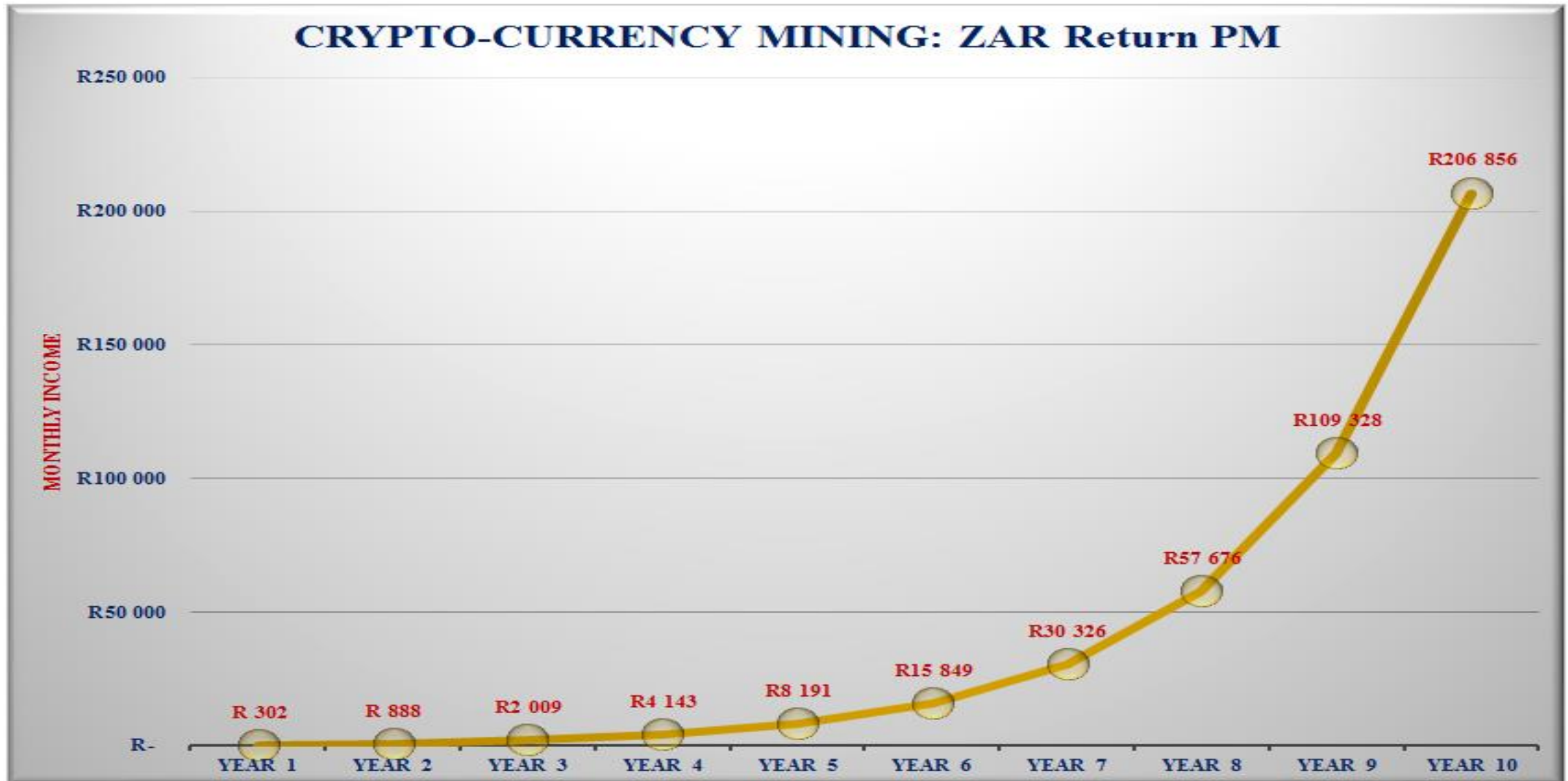


Effects of Inflation

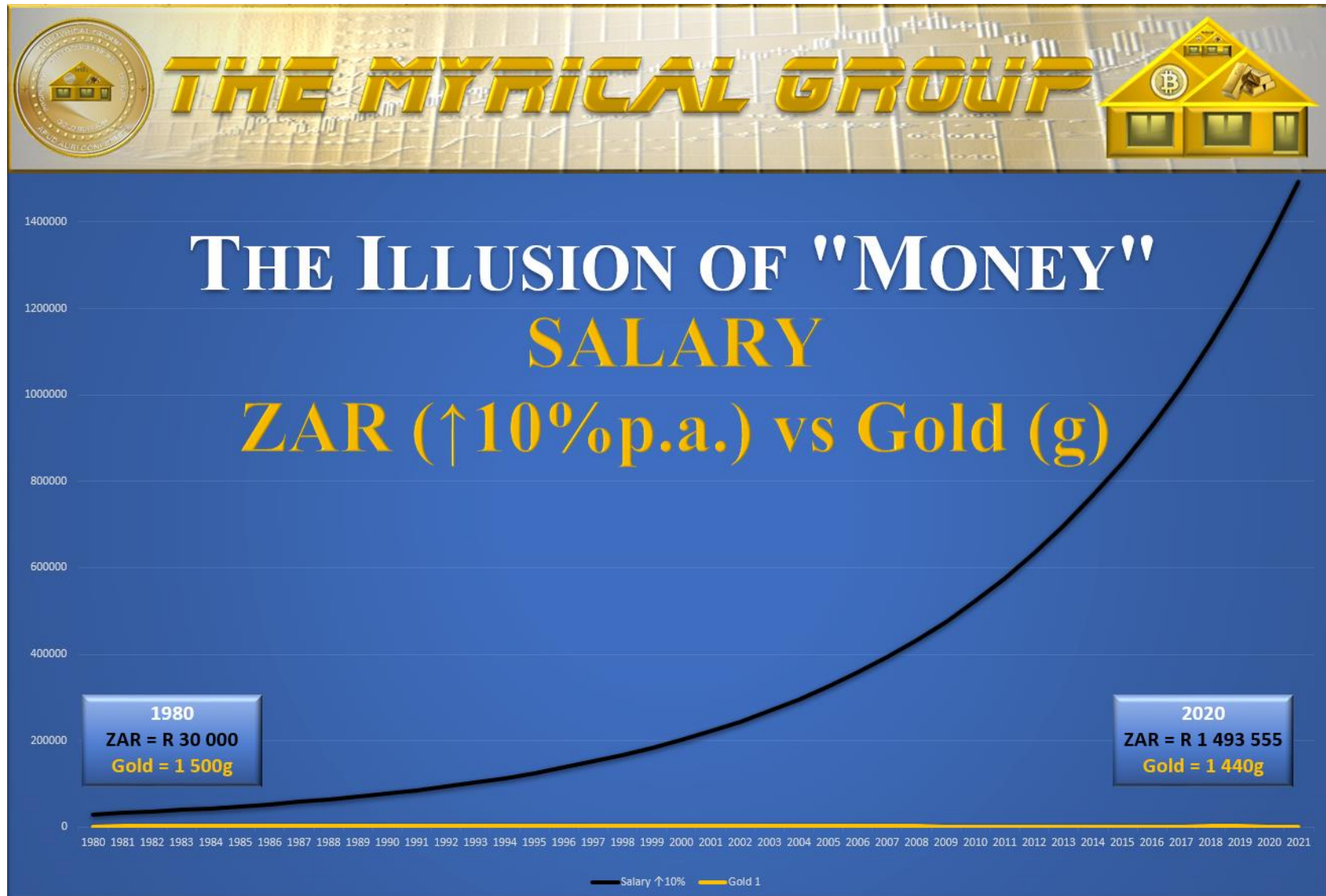
ZAR Purchasing Power Devaluation 1958 - 2023



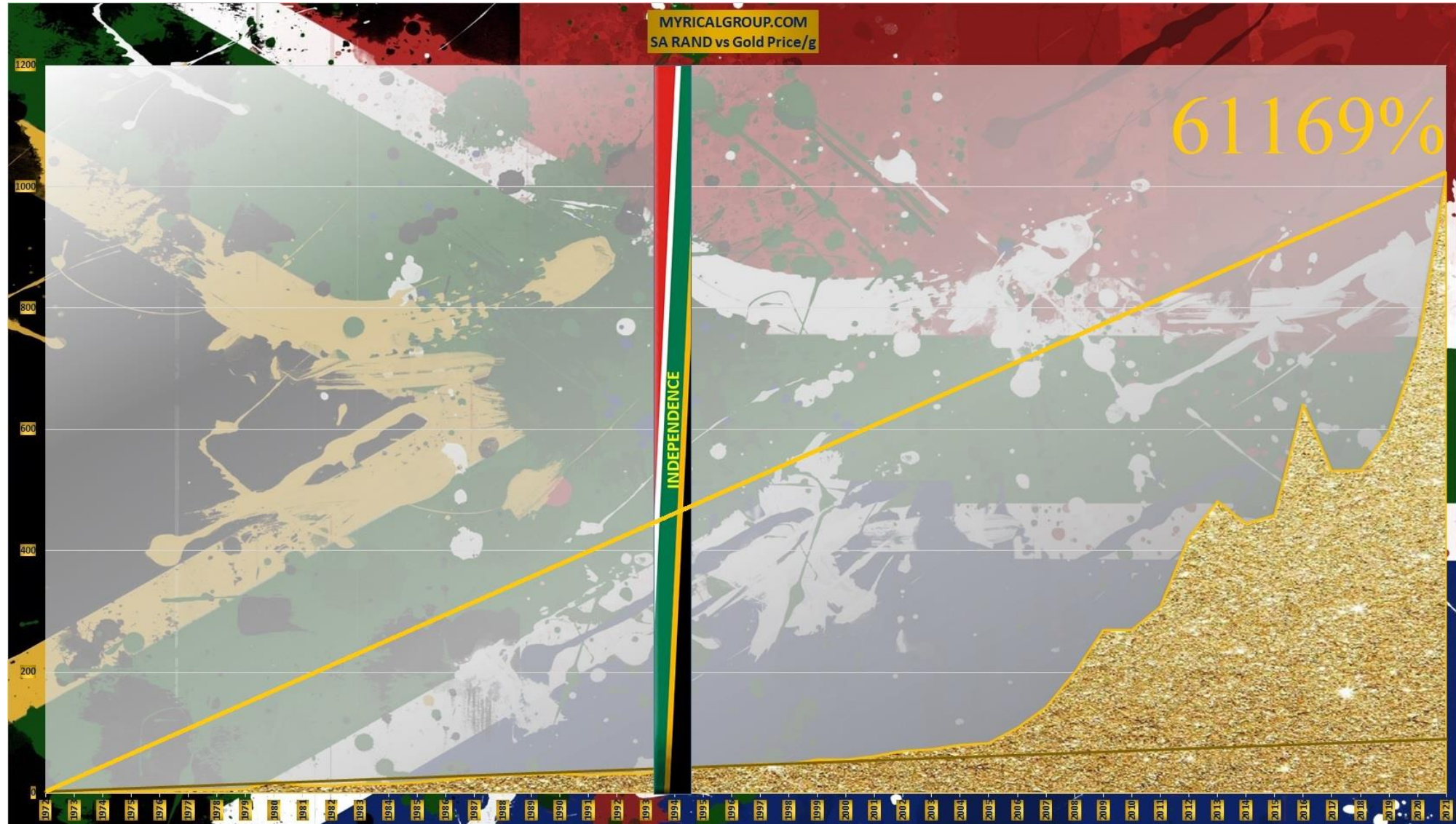
Effects of Inflation



Effects of Inflation



Effects of Inflation



Example 1

- Based on the basket of goods below, calculate the price index and increase in the cost of living for Maretha, a retiree living in a comprehensive senior accommodation in Cape Town:

Items	Quantity	Prices 2012	Prices 2013
Rent and rates	12	50	60
Food	24	15	16
Clothing	6	60	50
Travel	2	400	420

Example 1 (Answer)

Step 1: Calculate the cost of the basket in each year

Item	Quantity	2012 Cost (Qty × Price)	2013 Cost (Qty × Price)
Rent and rates	12	$12 \times 50 = 600$	$12 \times 60 = 720$
Food	24	$24 \times 15 = 360$	$24 \times 16 = 384$
Clothing	6	$6 \times 60 = 360$	$6 \times 50 = 300$
Travel	2	$2 \times 400 = 800$	$2 \times 420 = 840$
Total		R2,120	R2,244

Example 1 (Answer)

Step 2: Calculate the Price Index (2012 = 100)

$$\text{Price Index}_{2013} = \left(\frac{2,244}{2,120} \right) \times 100 = 105.85$$

Step 3: Increase in the cost of living

$$\text{Increase} = \left(\frac{2,244 - 2,120}{2,120} \right) \times 100 = 5.85\%$$

Answer:

- Price Index (2013) = **105.85**
- Increase in cost of living = **5.85%**

Example 2

- Assume that a UCT student spends money on only three goods: Food, Textbooks and Entertainment. The quantity and prices of these items are shown below:

	Year	Food	Textbooks	Entertainment
Quantity		20	1	5
Prices	2015	3	10	6
	2016	3.2	10	6.5
	2017	3.1	10	7
	2018	3.5	10	7.5

- Construct a price index based on the data provided.
- Calculate the rate of inflation for each year.

Example 2 (Answer)

- Step 1: Calculate the cost of the basket each year
- (Quantities fixed: Food = 20, Textbooks = 1, Entertainment = 5)

Year	Food Cost	Textbooks Cost	Entertainment Cost	Total Cost
2015	$20 \times 3 = 60$	$1 \times 10 = 10$	$5 \times 6 = 30$	R100.00
2016	$20 \times 3.2 = 64$	$1 \times 10 = 10$	$5 \times 6.5 = 32.5$	R106.50
2017	$20 \times 3.1 = 62$	$1 \times 10 = 10$	$5 \times 7 = 35$	R107.00
2018	$20 \times 3.5 = 70$	$1 \times 10 = 10$	$5 \times 7.5 = 37.5$	R117.50

Example 2 (Answer)

- Step 2: Construct the Price Index (2015 = 100)

Year	Price Index Calculation	Index
2015	$(100 / 100) \times 100$	100.0
2016	$(106.50 / 100) \times 100$	106.5
2017	$(107.00 / 100) \times 100$	107.0
2018	$(117.50 / 100) \times 100$	117.5

Example 2 (Answer)

- **Step 3: Calculate the year-on-year rate of inflation**

Period	Calculation	Inflation Rate
2015 → 2016	$(106.50 - 100) / 100 \times 100$	6.50%
2016 → 2017	$(107.00 - 106.50) / 106.50 \times 100$	0.47%
2017 → 2018	$(117.50 - 107.00) / 107.00 \times 100$	9.81%

Example 3

- The table below shows the prices of fruits purchased by Mihlani from 2001 to 2004.
- Calculate the fruit price inflation using this data.

Item	Quantity	2001	2002	2003	2004
Apple	10	0.50	0.75	0.85	0.88
Banana	12	0.20	0.25	0.25	0.29
Grapes	2	0.65	0.70	0.90	0.95
Raspberry	1	2.00	1.90	2.05	2.13

Example 3 (Answer)

- **Step 1: Cost of the Fruit Basket each year**

Year	Apple Cost	Banana Cost	Grapes Cost	Raspberry Cost	Total Cost
2001	$10 \times 0.50 = 5.00$	$12 \times 0.20 = 2.40$	$2 \times 0.65 = 1.30$	$1 \times 2.00 = 2.00$	R10.70
2002	$10 \times 0.75 = 7.50$	$12 \times 0.25 = 3.00$	$2 \times 0.70 = 1.40$	$1 \times 1.90 = 1.90$	R13.80
2003	$10 \times 0.85 = 8.50$	$12 \times 0.25 = 3.00$	$2 \times 0.90 = 1.80$	$1 \times 2.05 = 2.05$	R15.35
2004	$10 \times 0.88 = 8.80$	$12 \times 0.29 = 3.48$	$2 \times 0.95 = 1.90$	$1 \times 2.13 = 2.13$	R16.31

Example 3 (Answer)

- Step 2: Fruit Price Index (2001 = 100)

Year	Calculation	Price Index
2001	$(10.70 / 10.70) \times 100$	100.00
2002	$(13.80 / 10.70) \times 100$	128.97
2003	$(15.35 / 10.70) \times 100$	143.46
2004	$(16.31 / 10.70) \times 100$	152.43

Example 3 (Answer)

- **Step 3: Year-on-Year Fruit Price Inflation**

Period	Calculation	Inflation Rate
2001 → 2002	$(13.80 - 10.70) / 10.70 \times 100$	28.97%
2002 → 2003	$(15.35 - 13.80) / 13.80 \times 100$	11.23%
2003 → 2004	$(16.31 - 15.35) / 15.35 \times 100$	6.25%

Relationship between Inflation and Purchasing Power

- The higher the inflation rate, the less the value of a given rand amount over time (i.e. the purchasing power of a given amount declines).
- The purchasing power (real value) of a nominal rand amount can be calculated using the following formula:

$$Y_n = \text{Nominal rand amount} \times \left(\frac{CPI_{n-1}}{CPI_n} \right)$$

OR

$$Y_n = \text{Nominal rand amount} \times \left(\frac{1}{(1 + P_n)^n} \right)$$

Where:

Y_n	= purchasing power (real value) of a rand amount after n years
CPI_n	= Consumer Price Index in Year n (Current Year)
CPI_{n-1}	= Consumer Price Index in Year $n-1$ (Previous Year)
P_n	= annual inflation rate
n	= number of years

Example 4

- a) At an inflation rate of 2%, how much would R100 be worth after 1, 5, 10 and 40 years?**
- b) Repeat the analysis if the inflation rate was 6% or 15%.**

Example 4 - Answer

Years	2%	6%	15%
1	98.04	94.34	86.96
5	90.57	74.73	49.72
10	82.03	55.84	24.72
40	45.29	9.72	0.37

Example 5

If the inflation rate is 4% per year, what is the purchasing power of R1,000 after 20 years?

Example 5 - Answer

$$Y_n = \text{Nominal rand amount} \times \left(\frac{1}{(1 + P_n)^n} \right)$$

- $Y_{20} = 1,000 \times \left(\frac{1}{(1.04)^{20}} \right)$
- $Y_{20} = 1,000 \times 0.4564 = R456$

Example 6

Suppose that your rental income was R200,000 in 1992 and R250,000 in 1997.

Were you really better off in 1997 compared to 1992?

Note:

- CPI 1992 = 140.3
- CPI 1997 = 160.50

Example 6

Step 1: Convert 1997 income into 1992 rands (real terms)

$$\text{Real Income}_{1997} = 250,000 \times \left(\frac{140.3}{160.50} \right) = 250,000 \times 0.87246 = R218,115$$

Step 2: Compare

Year	Nominal Income	Real Income (1992 rands)
1992	R200,000	R200,000
1997	R250,000	R218,115

Conclusion:

Yes – you were better off in real terms in 1997.

Real purchasing power increased by approximately 9.06%.

Inflation and the Required Rate of Return

- **If future payments will be diminished in value because of inflation, investors will demand an interest rate higher than the real risk-free rate so that their expected purchasing power actually increases.**
- **The nominal risk-free rate adjusts the real risk-free rate to reflect expected inflation over the life of the investment.**

Inflation and the Required Rate of Return

Fisher's Equation

$$1 + R = (1 + r)(1 + p)$$

Where:

R = Nominal rate of return

r = Real rate of return

p = Inflation rate

Example 7 (Fisher)

Your luxury apartment is expected to yield a nominal rate of 20%.

What is the real rate of return if the expected rate of inflation is 15%?

Example 7 (Fisher) - Answer

$$1 + R = \frac{1 + r}{1 + p}$$

$$r = \frac{1 + R}{1 + p} - 1$$

$$r = \frac{1.20}{1.15} - 1$$

$$r = 0.0435 = 4.35\%$$

Example 8 (Fisher)

What is the real rate of return on a property investment that yields 14% if the current rate of inflation is 11.9%?

Example 8 (Fisher) - Answer

$$r = \frac{1 + R}{1 + p} - 1$$

$$r = \frac{1.14}{1.119} - 1$$

$$r = 0.01877 \approx 1.88\%$$

Example 9 (Fisher)

If you require a real rate of return of 8% and the inflation rate is expected to be 2%, what is the nominal rate of return you should require?

Example 9 (Fisher) - Answer

$$1 + R = (1.08)(1.02) = 1.1016$$

$$R = 1.1016 - 1 = 0.1016 = 10.16\%$$

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QUESTIONS

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