* **Short Term High-Risk Investment:**
* **Short Term Low-Risk Investment:**
* **Long Term Low-Risk Investment:**
* **Long Term High-Risk Investment:**

**Intro slide 1 – picture of something.**

**To be remembered**

* + We’re giving advice on which precious metals could be the best to invest in depending on the user’s needs, and whether in some cases precious metals are good to invest in at all.
  + For this, we will essentially be predicting the prices of precious metals in the short term and in the long term.
  + In order to predict, we first need to look at the other economic indicators, as there’s usually a relationship between precious metals and inflation, bank of England interest rates, and GDP. Thus, predicting these economic indicators can help us predict prices of precious metals in the future.

To be remembered

General relationships between EIs and PMs:

* + Inflation generally has a positive correlation with gold due to it being an inflation hedge.
  + We also expect inflation to have a positive correlation with silver as we expect gold and silver to be coupled.
  + Interest rates tend to affect all pm, and high interest rates cause lower the prices as these make other assets more competitive.
  + Low GDP causes higher prices in precious metals which means that precious metals tend to recover than other assets.

Slide 2

Noticeable periods in our historical data where the historical data didn’t go as expected

* + 2020 Covid
  + 2008 Financial Crisis
  + In 1990 UK joins ERM (Europe)
  + 2022/2023 cost of living crisis/stagflation

A graph with blue and red lines

Description automatically generated

^change name of graph

Current economic situation in the UK:

* + The UK is currently in an unstable time-period:
  + Stagflation (high inflation and low GDP)
  + Cost of living crisis (very high energy prices)
  + Unstable Government (4 prime ministers in 4 years)
  + SHORT TERM: Right now and for the short-term future, we don’t expect the precious metal prices to follow the usual trends that we expect, and we expect very high deviation.
  + LONG TERM: However, for the long-term future, we expect that the precious metal prices will follow the expected patterns as in the long term, the market tends to even out.

Slide 3

**SHORT TERM**

**Looking into the unexpected correlations between economic indicators and precious metals**

**From our correlation coefficient calculations -**

A graph with lines and numbers

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A graph with blue and red lines

Description automatically generated

To be flash carded

In 1990 there’s no relationship between gold and inflation which is unexpected. And there’s no correlation between interest rates and any of the metals which is also unexpected. We believe this is due to the UK joining the European exchange rate mechanism (ERM) which they later exited in 1992.

In 2008 there was a very strong positive correlation between all precious metal prices, which in turn meant that there was an unexpected strong negative correlation between the pms and inflation. There was also an unexpected positive correlation between pm prices and GDP possibly explained by the financial crisis causing all of these to fall.

In 2022 inflation rates skyrocketed, so the bank of England drastically increased the interest rates in an attempt to lower inflation. This explains strong negative correlation between all pms and interest rates. This also goes some way to explaining the strong negative correlation between pms and inflation as the attempted measure to lower inflation by the bank of England failed.

In 2023, interest rates continued to rise however there is a weak correlation between interest rates vs gold and silver. there is also a weak correlation between inflation vs gold and silver. Notably, we looked at the global energy prices with a base index of 100 in 2010. In 2022 energy prices were extremely high at an index of 152 whereas in 2023 the expected index will be 112. This emphasises how large the energy price increase was in 2022, which explains the unexpected correlations.

Given that we are in uncertain times right now, we expect that there’s an opportunity for very high returns in the short term however this comes with a high risk.

**Slide 4 – Explain opportunity and Risk**

(Higher volatility generally means higher risk because there's a greater chance that the price of an asset might move unexpectedly, which could lead to both larger gains and larger losses. Investors often associate higher volatility with higher potential returns but also higher risk)

A graph with lines and numbers

Description automatically generated with medium confidence

From our correlations and now our volatility analysis we can see that mostly gold has a lower volatility and therefore a lower risk during unstable periods, this suggests that gold is the safer of the four however it is still high risk and subject to investor confidence and market conditions out of the four palladium demonstrates the highest opportunity for short term gains however it is also very volatile so associated with the highest risk. This is followed by platinum at second most volatile.

(Notably, we haven’t used machine learning predictions from python for short term investments because due to the high volatility, short term predictions made by machine learning are likely very inaccurate.)

For investors interested in a high short-term return, and are also happy taking a high risk, we would recommend palladium or platinum.

As shown by the volatility graph, the PM market is quite volatile in the short term. This makes short term investment in PMs risky and a potential investor who is looking for more guaranteed gains is better off investing in other ways such as Gilts and savings bonds (savings account, interest is usually compounded), where your initial investment amount is guaranteed.

Gilts are government bonds where an individual lends to the government for a fixed interest rate (called a coupon, usually returned annually or semi-annually). These are generally held by the government for 2, 5, 10 and 30 years before your money is returned.

These gilts can also be bought and sold on the open market however a holder does not have to sell their bonds on this market and can wait until the end of the period for their investment to be returned.

Index linked gilts can also be issued, reducing the risk of these assets being eroded by inflation, as these retain their real value (returns and investment is adjusted for inflation - RPI). Because of the lowered risk of negative gains (inflation above interest payments) the return is lower. This type of gilt is an inflation hedge as it is unlikely the UK government will become insolvent.

**For investors looking for more guaranteed gains, we recommend investing in standard Gilts and savings bonds over precious metals. For investors looking for even lower risk investments, we recommend indexed linked gilts.**

**LONG TERM**

In long term investments generally speaking volatility becomes less relevant as the assets have time to ride the peaks and troughs of the market, making it less risky to invest over a large time period vs a short one. Therefore in order to properly analyse the best assets to invest in over the long term we are focusing more on potential returns.

A graph with lines and numbers

Description automatically generated with medium confidence

A screen shot of a computer

Description automatically generated

As we have already shown with our previous volatility calculations gold is the least volatile asset during periods of economic uncertainty however when looking at the volatility of the metals from 1990-2023, we can see that silver has the lowest volatility overall. Platinum and palladium have the highest overall volatilities.

This means that gold and silver are 2 of the least risky investments and have the most stable returns. However, this also means that they can result in the least amount of returns. This is confirmed by our machine learning python predictions, where if an investor wanted to invest $1000 for 10 years, they would get the lowest amount of return from gold, followed by silver. Platinum and palladium show higher returns over the long term.

To compare this to a similar market, we looked at the FTSE 100 and found that in the last 10 years the index price increased by 23%. On the other hand, gold prices increased by around 50% indicating that there is potential for higher returns when investing in gold.

For investors interested in long term investments, we would recommend all precious metals. For investors that are happy to take a higher amount of risk, we would recommend a higher proportion of your investment to be put into palladium and platinum.

For investors that are more comfortable with a lower amount of risk, we would recommend a higher proportion of your investment to be put into gold and silver. However, it’s important to note that Gold is a special case as its primary function is being an inflation hedge and haven. Other metals don’t have this function and they are much more heavily influenced by manufacturing technology changes due to their uses.

For a long-term investor who wants to mitigate much of their risk, long term gilts are still available but as discussed earlier returns are much lower.

**Limitations:**

This advice is based on forecasts and historical analysis. In reality the market is dictated largely by key market players (self-fulfilling prophesy)

**Looking at power BI forecasts compared to python forecasts:**

When we look at the predicted prices at the end of the 1-year investment (in 2024), they’re different in the power bi forecasts compared to the python machine learning prediction.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **2023 price** | **Predicted 2024 price (Power BI)** | **Predicted 2024 price (python)** | **Percentage change (power BI)** | **Percentage change (python)** |
| **Palladium** | 1400.06 | 1573.81 | 1513.98 | 12.41% | 8.14% |
| **Platinum** | 971.88 | 1002.57 | 1369.63 | 3.16% | 40.93% |

This shows that even though in python machine learning platinum is predicted to have a higher return for the 1-year investment, according to the power bi forecasts palladium is predicted to have a higher return.

This again shows that for short term both palladium and platinum are good options, but we can’t necessarily predict which one will give a higher return within a year as different models predict different outcomes or this.