Sol 1.

To determine which stock is the most attractive, we will compare several key parameters to evaluate which one outperforms the S&P 500 benchmark while also offering a favorable risk-return balance.

A useful metric for assessing the best "bang for the buck" is the **Sharpe Ratio**. This measure considers the historical return of the stock, denoted as E[Ri], subtracts the risk-free rate (Rf), and divides the result by the stock's standard deviation (σi), which represents its total risk.

In this case, we are using a **risk-free rate of 6.0%**, which is based on the 10-year U.S. Treasury bill yield. With the expected return (E[Ri]) and the **annualized standard deviation** (σi) for each stock, the Sharpe Ratio (Si) can be calculated using the following formula:

Sharpe Ratio (Si) = (E[Ri] – Rf) / σi

This ratio helps us understand how much excess return a stock generates per unit of risk. A higher Sharpe Ratio indicates a more attractive investment when comparing assets with different risk and return levels.

**Code in python notebook.**

Delphi has the highest Sharpe Ratio, indicating strong risk-adjusted returns. It offers a decent dividend yield of 1.25% and a moderate safety rating of 3. While Kellogg has a higher yield and lower risk, its low expected return makes it less attractive. Delphi’s low P/E ratio (13.6) also suggests better value compared to Kellogg and Kinross. Overall, Delphi strikes the best balance of return, risk, and valuation, making it the most suitable choice for the fund.

Sol 2.

The primary metric for assessing a stock's risk is its **standard deviation**, which reflects the volatility of its returns. A higher standard deviation indicates greater price fluctuations and less predictability. Below is a brief summary of the standard deviation levels for the four stocks under consideration.

**Code in python notebook.**

Based on the initial analysis of historical standard deviation, **Kellogg emerges as the least risky stock**, whereas **Groupon and Kinross** exhibit high volatility—consistent with the inherent instability of the tech and gold sectors, which are prone to sharp market swings and uncertainties.

Another key metric in evaluating risk is **beta**, which measures a stock’s sensitivity to overall market movements. Unlike unsystematic risk, beta captures **systematic risk**, which cannot be diversified away and plays a significant role in driving price fluctuations.

Based on beta values, **Kellogg and Kinross Gold** show low sensitivity to market movements, indicating lower systematic risk. However, **Kinross** still displays high overall volatility. On the other hand, **Groupon** has the highest beta, making it highly sensitive to market shifts. **Delphi**, with a beta slightly above 1, is only moderately more volatile than the market.

Taking both standard deviation and beta into account, **Kellogg emerges as the most stable and low-risk option**, consistent with the steady nature of the food industry. **Groupon**, with high volatility and high market sensitivity, stands out as the riskiest, reflecting the tech sector’s strong exposure to market trends.

Sol 3.

Portfolio diversification plays a key role in redefining individual stock risk within the broader portfolio context. While measures like **standard deviation** and **beta** assess a stock’s standalone volatility, combining stocks with **low or negative correlation** can significantly reduce total portfolio risk—even if the individual stocks themselves are highly volatile.

The portfolio variance is calculated using the formula:  
 σ²ₚ = w₁²σ₁² + w₂²σ₂² + 2w₁w₂σ₁σ₂ρ

Where:

σₚ = overall portfolio standard deviation  
w₁, w₂ = weights of the two assets  
σ₁, σ₂ = standard deviations of the assets  
ρ = correlation between their returns

This shows that portfolio risk is shaped not just by individual volatilities, but also by how the assets move in relation to one another. A **low or negative correlation** reduces the covariance term, thus lowering the total risk of the portfolio.

In practical terms, this means that even **risky stocks like Groupon or Kinross** can improve the **fund’s overall risk-return profile** when paired with other assets that don’t move in sync. This is the core principle behind diversification—it reduces **unsystematic risk** and helps achieve more stable returns.

Sol 4.

Kramer’s argument rests on the principle of diversification: when two assets are not perfectly positively correlated, a portfolio combining them can have **lower overall risk** than either asset individually. Despite **Groupon and Kinross Gold** having very high standard deviations—67.3% and 65.0% respectively—their combination can reduce risk due to **offsetting price movements**. In fact, the observed combined volatility is lower than the individual volatilities, confirming the **risk-reducing effect of diversification**.

**Code in python notebook.**

The validity of Kramer’s claim depends on the **correlation** between Groupon and Kinross's monthly returns from 2012 to 2017. If this correlation is **significantly less than +1**, the covariance term in the portfolio variance formula becomes smaller or even negative, which **lowers the total portfolio volatility (σₚ)**—supporting the core idea behind diversification.

Sol 5.

The main argument supporting **Kinross Gold** is its **diversification value** within a broader portfolio like the Cavalier Fund. Although Kinross has a high individual risk with a standard deviation of 65.0% and a modest expected return of 8.4%, its **low or negative correlation** with stocks like **Groupon** or **Kellogg** enhances its usefulness in a mixed portfolio.

As a **gold mining stock**, Kinross is typically **counter-cyclical**—tending to perform well during economic downturns or periods of market stress. This makes it a valuable **hedge** against traditional equity risk, even if it’s not the top performer on its own.

Kramer’s point is that Kinross, when paired with uncorrelated assets, can **reduce total portfolio risk**. For instance, a 50-50 mix with Groupon results in a combined standard deviation that is lower than that of either stock alone, thanks to their imperfect correlation.

While its high P/E ratio of 24.6 suggests speculative pricing, Kinross’s true strength lies in its ability to **diversify away systematic risk**. Its value is not in isolation, but as a **strategic addition** to a portfolio aiming for more **stable, risk-adjusted returns**.

Thus, **Kinross Gold’s importance lies in portfolio construction—not in standalone performance.**

Sol 6.

Investors should demand higher expected returns for taking on greater risk—this is the foundation of risk pricing in financial markets. The **Capital Asset Pricing Model (CAPM)** formalizes this idea by offering a benchmark to evaluate whether a stock’s return justifies its risk exposure.

**CAPM Framework:** According to CAPM, the expected return on a security is calculated as:  
 **Rᵢ = Rf + βᵢ(Rm − Rf)** Where:

Rᵢ is the expected return of the asset  
Rf is the risk-free rate  
βᵢ is the asset’s beta (its sensitivity to market movements)  
Rm is the expected market return

This model stresses that only **systematic risk** (beta) is priced in equilibrium. **Unsystematic risk** doesn’t earn a premium because it can be diversified away.

**Risk–Return Trade-off:** To evaluate if an investor is being properly compensated for risk, we use metrics like:

**Sharpe Ratio** (accounts for total risk): (Rᵢ − Rf) / σᵢ  
**Treynor Ratio** (focuses on systematic risk): (Rᵢ − Rf) / βᵢ

Higher ratios indicate better return per unit of risk, making them useful tools for comparing investments.

In essence, **risk should be priced** based on the return investors require for taking on more volatility or market exposure. CAPM offers a structured way to assess this, guiding investors toward portfolios that deliver the **most efficient risk-return trade-offs**.

Sol 7.

Let’s calculate the **CAPM benchmark return** for each stock using the formula:

**Rᵢ = Rf + βᵢ × MRP**

Where:

**Rᵢ** is the expected return based on systematic risk  
**Rf = 6.0%** (risk-free rate, using long-term government bond average)  
**MRP = 12.0% − 6.0% = 6.0%** (market risk premium, based on S&P 500 returns)

So, for each stock, we plug in its **βᵢ** to get the CAPM return.  
 Since we’re using the **S&P 500 as the benchmark**, its risk-adjusted return is simply its average return:  
 **R\_S&P500 = 12.0%**

This lets us compare each stock’s actual return with what CAPM says it *should* earn based on risk.

Sol 8.

Kellogg has low volatility but falls short on risk-adjusted returns. Groupon delivers high returns but with too much risk. Kinross adds value through diversification, thanks to its low correlation with other stocks. Delphi offers the strongest return-risk balance, despite a small negative alpha. A smart combination—led by Delphi, backed by Kellogg’s stability, and diversified with Kinross—can create a balanced portfolio with solid performance potential.