Assignment-2 solutions

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1. Of the four candidates for purchase by the Cavalier Fund—Delphi Automotive, Groupon, Kellogg, and Kinross Gold—Delphi is the best investment candidate when considering both potential return and risk exposure. With a forecasted return of 9.1% and a standard deviation per annum of 24.8%, Delphi has the highest Sharpe Ratio (0.27) of the group, reflecting the best risk-adjusted returns among its peers. Though Groupon has a higher expected return (9.3%), it's very high volatility (67.7% standard deviation) renders it much riskier, as witnessed in its much lower Sharpe Ratio (0.10). Kellogg, by contrast, offers the lowest risk (14.6% standard deviation) but also the lowest expected return (4.6%), which equates to limited upside potential for growth-oriented investors. Kinross Gold falls in the middle with an 8.4% expected return, but its high volatility (65.0% standard deviation) and commodity-driven risks make it less reliable than Delphi. Beyond quantitative metrics, Delphi's fundamentals further reinforce its appeal: it operates in the stable auto parts sector, offers a dividend yield (1.52%), and maintains an investment-grade credit rating (Baa2), unlike Kinross (Ba1) or Groupon (unrated). Additionally, Delphi's beta of 1.30 suggests balanced exposure to market movements—high enough to benefit from economic growth but lower than Groupon's 1.45, which could lead to sharper downturns. Although CAPM analysis shows Delphi is slightly overvalued (with a negative Alpha of -5.8%), this is still preferable to Groupon's -7.0% or Kellogg's -4.5%, as Delphi's stronger fundamentals and sector positioning provide a margin of safety. In the end, Delphi is the best combination of growth potential, manageable risk, and financial stability and thus the most suitable standalone investment for the Cavalier Fund. Though diversification approaches (e.g., mixing Groupon and Kinross) can mitigate portfolio risk, the consistent performance and lower volatility of Delphi make it the best top pick for achieving risk-adjusted returns.

Delphi	1.30	2.34% + 1.30*9.66% = **14.90%**	9.1%	**-5.8% (Overvalued)**
Groupon	1.45	2.34% + 1.45*9.66% = **16.34%**	9.3%	**-7.0% (Overvalued)**
Kellogg	0.70	2.34% + 0.70*9.66% = **9.10%**	4.6%	**-4.5% (Overvalued)**

Kinross Gold	0.80	2.34% + 0.80*9.66% = **10.07%**	8.4%	**-1.7% (Slightly Overvalued)**

2. The four stocks under analysis—Groupon, Kinross Gold, Delphi Automotive, and Kellogg—exhibit different degrees of risk according to their volatility, market sensitivity, and fundamental strength. Groupon is the riskiest investment opportunity because of its high volatility, with an annualized standard deviation of 67.7%, and high market sensitivity (β=1.45). Its poor fundamentals, such as negative earnings and no dividend payments, increase its riskiness even more, which brings it a safety rating of 5/5 (highest risk).

Kinross Gold is also of high risk, albeit lower than that of Groupon, with a volatility of 65% and a beta of 0.80. Its commodity price exposure brings with it a further level of uncertainty, which serves to merit its high-risk safety rating of 5/5.

Delphi Automotive provides a more balanced risk-reward profile with moderate volatility (24.8% standard deviation) and a beta of 1.30, a testament to its solid position in the auto industry. It has better fundamentals compared to Groupon and Kinross and is thus a better choice with a safety rating of 3/5.

Lastly, Kellogg is the safest option, with low volatility (14.6% standard deviation) and defensive nature (β=0.70). It has solid fundamentals such as consistent dividend payout, which reinforce its stability, yielding it a safety rating of 1/5 (lowest risk).

Based on these evaluations, Delphi Automotive presents the most attractive choice for the Cavalier Fund's holdings, providing a decent trade of risk for return. Kellogg would be an anchor point if necessary, and Groupon and Kinross Gold are too risk-laden for a conservative approach

3. Portfolio diversification radically alters the way we approach the assessment of individual stock risk by framing the issue in terms of how each security adds to total portfolio risk rather than its isolated volatility. Stocks such as Groupon and Kinross Gold seem very risky when viewed in isolation (with yearly standard deviations of 67.7% and 65% respectively), but their risk credentials are greatly enhanced when grouped together in a portfolio because they are so poorly correlated (about 0.25). This diversification advantage is the fact that a 50-50 mix of these two high-risk stocks generates a lesser overall combined volatility (52.1%) than either stock individually, showing how effective asset diversification can reduce aggregate risk exposure.

The key realization of modern portfolio theory is that diversification enables investors to divers away firm-specific risk but not market-wide risk. This is why high-beta stocks such as Groupon (β=1.45) and Delphi (β=1.30) continue to be responsive to

market fluctuations even in a diversified portfolio, and low-beta stocks such as Kellogg (β=0.70) continue to maintain stability. The operational implication for the Cavalier Fund is that equity selection has to consider not only single risk measures, but how each investment plays with and supplements the current portfolio.

To achieve the best results, the fund must mix securities with varying risk-return profiles: Delphi provides growth potential with minimal risk, Kinross offers diversification advantages in the form of low correlation, and Kellogg acts as a stabilizing anchor. This hybrid strategy would enable the fund to capture returns while better controlling overall volatility than through concentration on independent stock characteristics. The most important lesson here is that in portfolio management, the entire is generally less risky than the total of its parts when correctly diversified assets.

(Weight1^2*σ1^2) + (Weight2^2*σ2^2) + (2*Weight1*Weight2*ρ*σ1*σ2)

= (0.5^2*0.677^2) + (0.5^2*0.65^2) + (2*0.5*0.5*0.25*0.677*0.65)

=0.1146 + 0.1056 + 0.0550

=0.2752

=square root of (0.2752) = 52.1%

Average Standalone Risk: (67.7% + 65%)/2 = 66.35%

Diversification Benefit: 66.35% → 52.1% (14.25% reduction)

4. The computations show that through the combination of Groupon and Kinross Gold in a 50-50 portfolio, we can calculate mathematically the limits of potential portfolio risk. The highest achievable standard deviation (when correlation ρ = +1) is 66.35%, which is in fact the weighted average of the two individual standard deviations (67.30% and 65.00%). This is the worst-case situation when both stocks move perfectly together, no diversification benefit is available.

Most significantly, the theoretical minimum possible standard deviation (when ρ = -1) falls precipitously to only 1.35%. That is the ideal case of perfect negative correlation in which the two stocks' movements perfectly counteract each other. In the real world, with the real correlation being ρ = 0.25, we have a big but not so extreme risk reduction to 52.1%.

			Standard devaition	variance	weights
Groupon	Internet information	-9.80%	67.30%	45.292900%	0.5

Kinross Gold	Gold	-2.00%	65.00%		42.250000%	0.5

COVARIANCE	MAX=1	MIN=-1	
NOW TOTAL SD		MAX	**66.35%**
		MIN	1.35%

5.Kinross Gold is an unappealing, high-risk, low-reward investment for the Cavalier Fund from both historical and forward-looking perspectives. The gold mining company provided a terrible -2.0% annual rate of return from 2012-2017, the lowest of the four evaluated stocks, and yet was incredibly volatile (65% standard deviation). This negative return mixed with high risk makes Kinross an especially bad stock to invest in as a single holding.

The risk-adjusted measures also verify Kinross's deficiencies. Its Sharpe Ratio of only 0.093, determined as ((8.4% expected return - 2.34% risk-free rate) / 65% volatility), provides the worst compensation for risk of the alternatives. In CAPM analysis, Kinross is predicted to underperform its risk-adjusted benchmark by 1.67% (negative alpha), as its 8.4% projected return is below 10.07% necessary based on its market sensitivity (beta of 0.80).

6.

Stock Name	OLS Beta (βi)	Risk-Free Rate (Rf)	Market Risk Premium (MRP)	Expected Return (Ri) = Rf+(βi ×MRP)	Anticipated Annual Return
Delphi	1.29	2.40%	6.70%	2.40% + (1.29 * 6.70%) = 10.95%	9.10%
Groupon	1.44	2.40%	6.70%	2.40% + (1.44 * 6.70%) = 12.05%	9.30%
Kellogg	0.54	2.40%	6.70%	2.40% + (0.54 * 6.70%) = 6.02%	4.60%
Kinross Gold	0.31	2.40%	6.70%	2.40% + (0.31 * 6.70%) = 4.48%	8.40%

These above calculations are also shown in Excel sheet attached also.

Delphi: With an OLS Beta of 1.29, risk-free rate of 2.40%, and market risk premium of 6.70%, the expected return of Delphi using CAPM is 10.95%. This is more than its

expected annual return of 9.1%, which implies that it could be thought of as overvalued considering its risk.

Groupon: With an OLS Beta of 1.44, Groupon's CAPM expected return is 12.05%. This is significantly greater than its expected annual return of 9.3%, suggesting it may be overvalued from a risk-adjusted standpoint as well.

Kellogg: With a more modest OLS Beta of 0.54, Kellogg's CAPM expected return is 6.02%. This is greater than its expected annual return of 4.6%, which suggests it too may be overvalued based on systematic risk.

Kinross Gold: Having the lowest OLS Beta of 0.31, Kinross Gold's CAPM expected return is 4.48%. But its expected annual return is 8.4%, which is much higher than its CAPM expected return. This indicates that Kinross Gold seems undervalued in relation to its systematic risk and maybe as a value from a risk-adjusted point of view.

Delphi, **Groupon**, and **Kellogg** all have CAPM expected returns (10.95%, 12.05%, and 6.02% respectively) that are higher than their anticipated annual returns (9.1%, 9.3%, and 4.6% respectively). This suggests that, from a risk-adjusted perspective using the CAPM, these stocks might be considered overvalued, as their expected returns do not sufficiently compensate for their systematic risk. Kinross Gold's situation exactly opposite to the above one.

7. the risk-adjusted benchmark return for the S&P 500 portfolio and the individual proposed stocks, we use the Capital Asset Pricing Model (CAPM). This model helps us determine the expected return an investment *should* yield, given its level of systematic risk.

Risk-Free Rate (Rf): We've used the 10-year U.S. Treasury constant maturity yield as our proxy for the risk-free rate, which was 2.40% as of February 28, 2017. This is a standard choice for a risk-free benchmark, representing the return on an investment with virtually no default risk.

Market Risk Premium (MRP): This represents the additional return investors expect for investing in the overall market (like the S&P 500) compared to a risk-free asset. We calculate this by taking the historical geometric mean annual return of large company stocks (S&P 500 index) from 1926 to 2016, which was 10.1%. From this, we subtract the geometric mean annual return of 30-day U.S. Treasury bills over the same period, which was 3.4%. This gives us a Market Risk Premium of 10.1% - 3.4% = 6.7%.

Beta (βi): This measures a stock's sensitivity to movements in the overall market. A beta of 1 means the stock tends to move with the market, while a beta greater than 1 suggests it's more volatile than the market, and a beta less than 1 indicates it's less volatile.

The calculations of all these are in the attached Excel sheet.

8. Investors price risk by expecting to be paid more for investments with higher uncertainty, a basic principle measured by the Capital Asset Pricing Model (CAPM). CAPM assists in calculating the reference return a stock should pay based on its systematic (market) risk, for which investors are rewarded. Idiosyncratic (firm-specific) risk can be mostly diversified away and is therefore not rewarded.

For the Cavalier Fund, managed by Daniel Nickerson, stock selection must combine strong fundamental analysis—finding undervalued firms with sustained earning capacity—with quantitative risk-adjusted returns. Nickerson can apply CAPM to estimate each stock's required return using beta and then compare this with its expected return. When expected return is greater than the CAPM benchmark, the stock could be undervalued. In addition to individual factors, the stock's effect on the diversification of the overall portfolio also needs to be considered.

finally, we are able to conclude that, The S&P 500 risk-adjusted benchmark return is 9.10%.

Delphi Automotive (beta 1.29) has a CAPM expected return of 11.04%, exceeding its 9.1% expected return, implying it's likely to be overvalued.

Groupon (beta 1.44) displays a CAPM expected return of 12.05%, better than its 9.3% expected return, also pointing towards potential overvaluation despite extreme volatility and poor fundamentals.

Kellogg (beta 0.54) has a CAPM expected return of 6.02%, higher than its 4.6% expected return, indicating it too is overpriced, but it's the safest stock.

Kinross Gold (beta 0.31) is different. Its CAPM expected return is 4.48%, well below its 8.4% expected return. This positions Kinross Gold as being undervalued on a risk-adjusted basis, offering an attractive buy opportunity despite its high total volatility and commodity orientation.

Nickerson should focus on stocks such as Kinross Gold, where the expected return adequately compensates for systematic risk, with great caution when judging overall portfolio effect.