In this project we transform about six months of daily prices for a utilities ETF (XLU) and major constituent stocks into information we can actually use for analysis and decisions. Step (c) converts prices into **daily returns**, because raw prices tend to drift and trend while returns measure the size and direction of each day’s move in a way that is more comparable across stocks and through time. We work with **log returns** (the change in the natural log of price) since they add neatly over time and treat up and down moves more symmetrically; that makes the data steadier and easier to model. Step (d) prepares the return panel for fair comparison by **centering and scaling** each stock’s series: subtract the average and divide by the standard deviation. This removes level and volatility differences so no single volatile name dominates the analysis, and it aligns the data to study how stocks **co‑move** rather than how big they are. With this standardized return matrix in hand, step (e) applies **Principal Component Analysis (PCA)** to uncover the main patterns that drive the group. PCA finds special portfolio directions (called eigenvectors) that are uncorrelated with one another and ordered by how much of the total variation they explain (their eigenvalues). In our results, **the first component (PC1) explains about 60% of the cross‑sectional variance**, the **second about 13%**, and the **third about 4%**, so roughly **78%** of the movement across these utilities can be summarized by just the first three components. Looking at the PC1 loadings, most stocks load with a similar sign and size, which is exactly what we expect from a **broad sector factor**—a portfolio that behaves like the utilities market itself (an “XLU‑like” move). PC2 shows positives for more **merchant/market‑exposed** names (such as VST and CEG) and negatives for **regulated** utilities (such as SO and DUK), so it captures a clear, intuitive **within‑sector spread**: long the competitive generators and short the stable, regulated wires and pipes, or vice versa. PC3 highlights **NEE** on one side versus more traditional generators on the other, which looks like a **renewables/growth vs. conventional** theme. Importantly, the **sign** of any component is arbitrary—you can flip it for readability without changing its meaning—so we focus on relative signs and magnitudes. Step (f) uses the **Singular Value Decomposition (SVD)** on the same standardized return matrix. SVD writes the matrix as time patterns times **singular values** times stock‑space patterns. For standardized data, SVD and PCA tell the **same story**: the right‑hand singular vectors line up with the PCA eigenvectors (the same loading patterns), and the squares of the singular values rank the components by importance in exactly the same way (their shares of total variance). In our sample, the **first singular value is much larger than the rest**, matching PC1’s dominance; the second and third are clearly smaller but still meaningful, consistent with PC2 and PC3. Why do these transformations matter in practice? First, working with returns (not prices) and standardizing them gives us a clean, fair view of co‑movement. Second, PCA/SVD compress a noisy, many‑stock problem into a **few clear drivers** that we can use. For **risk management**, we can approximate the covariance of the group using just the top two or three components and treat the rest as idiosyncratic noise; that often produces more stable risk estimates. For **hedging**, if we want to isolate stock selection skill, we can neutralize exposure to PC1 (the broad sector move) so our portfolio is not simply riding utilities beta. For **relative‑value ideas**, PC2 suggests a straightforward market‑neutral trade between merchant and regulated utilities, while PC3 suggests a tilt between renewables‑oriented growth and conventional generation. For **communication**, the technical report should summarize the variance shares (≈60%, 13%, 4%), interpret the loading patterns (sector factor; merchant vs. regulated; renewables vs. conventional), and recommend action (hedge PC1 when seeking alpha, size PC2 bets prudently, and monitor PC3 for regime changes). The non‑technical report can say the same thing in plain language: most utilities move together, some are more sensitive to market prices, and some behave differently because of renewables growth; we can hedge the common move and position thoughtfully on the spreads. Finally, figures should have clear axis labels and scales, grammar should be clean, and the write‑up should end with **practical takeaways**: use returns, standardize, keep the top factors, and link each factor to an investable decision.

**Works Cited (MLA)**: Bodie, Zvi, Alex Kane, and Alan J. Marcus. *Investments*. 10th ed., McGraw‑Hill, 2014; Jolliffe, I. T. *Principal Component Analysis*. 2nd ed., Springer, 2002; Shlens, Jonathon. “A Tutorial on Principal Component Analysis.” *arXiv* 1404.1100, 2014; Campbell, John Y., Andrew W. Lo, and A. Craig MacKinlay. *The Econometrics of Financial Markets*. Princeton UP, 1997.