**Project - Data Warehouse and BI Dashboard for Retail**

**1. Azure Data Factory (ADF):**

* **Pricing model:** Pay-as-you-go (per activity run and data movement)
* **Estimate for AdventureWorks database:**
  + Assuming several data pipelines, extracting, transforming, and loading from on-premises SQL Server to the cloud.
  + **Data pipeline activities:** $0.25 per 1,000 activity runs.
  + **Data movement:** $0.10 per GB moved.

**Approximate monthly cost:**

* For about 50 pipeline activity runs per day with 100GB of data moved: **~$25 - $50/month**.

**2. Azure Data Lake Storage (Gen 2):**

* **Pricing model:** Pay for the amount of storage used and the number of operations.
* **Estimate for AdventureWorks database:**
  + **Storage cost:** $0.0184 per GB for hot storage.
  + **Operations cost:** Read/Write/Transaction requests are minimal, as this is a simple data lake with a few layers (bronze, silver, gold).

**Approximate monthly cost:**

* For 200GB of stored data: **~$4/month**.

**3. Azure Databricks:**

* **Pricing model:** Databricks unit/hour for the cluster (compute charges).
* **Estimate for AdventureWorks database:**
  + **Cluster size:** Small to medium-sized (4 to 8 cores).
  + **Estimated usage:** Assume moderate usage for data transformation (e.g., 10-20 hours/month).
  + **DBU (Databricks Unit) pricing:** Varies by region but typically around **$0.15 - $0.55 per DBU/hour**.

**Approximate monthly cost:**

* For moderate data processing: **~$100 - $150/month**.

**4. Azure Synapse Analytics:**

* **Pricing model:** Based on data warehousing units (DWU) or on-demand pricing for serverless SQL pool.
* **Estimate for AdventureWorks database:**
  + **On-demand SQL querying:** $5 per TB of data processed (serverless SQL).
  + **Provisioned resource pool:** DW100c typically costs around $1.51 per hour.
  + Assume **5-10 hours of querying** monthly for analysis and reporting.

**Approximate monthly cost:**

* Serverless or basic DWU: **~$50 - $100/month**.

**5. Azure Key Vault:**

* **Pricing model:** Per operation (secrets management).
* **Estimate for AdventureWorks database:**
  + **Key vault operations:** Minimal cost, as managing secrets is lightweight (e.g., $0.03 per 10,000 operations).

**Approximate monthly cost:**

* For secrets and minimal operations: **~$1 - $5/month**.

**6. Power BI:**

* **Pricing model:** Free version or Pro version for collaboration.
* **Estimate for AdventureWorks database:**
  + **Power BI Pro License:** $9.99 per user/month.
  + Assume **3-5 users** in the project.

**Approximate monthly cost:**

* For 3-5 users: **~$30 - $50/month**.

**7. Data Egress (if applicable):**

* **Pricing model:** Charges for data leaving Azure (outbound data transfer).
* **Estimate:** If transferring large amounts of data outside Azure (e.g., to local devices or other cloud services), data egress charges will apply.
* **First 5GB** of data outbound per month is free, after which costs can vary.

**Approximate cost:** **Varies** based on usage, typically **$0.087 per GB**.

**Total Estimated Monthly Costs:**

* **Azure Data Factory:** ~$25 - $50
* **Azure Data Lake Storage (Gen 2):** ~$4
* **Azure Databricks:** ~$100 - $150
* **Azure Synapse Analytics:** ~$50 - $100
* **Azure Key Vault:** ~$1 - $5
* **Power BI Pro (3-5 users):** ~$30 - $50
* **Data Egress:** ~$0 (if no major data transfer outside Azure)

**Total Estimated Monthly Budget: $210 - $350**

**Cost-Saving Suggestions:**

1. **Use Serverless SQL in Synapse Analytics** instead of a provisioned pool for lightweight queries, which could lower costs.
2. **Optimize Databricks usage** by running jobs on demand and shutting down clusters when not in use.
3. **Use Power BI free version** if advanced collaboration isn't required, which eliminates the per-user fee.