Exercise 1 - Code-free transformation at scale with Azure Synapse Pipelines

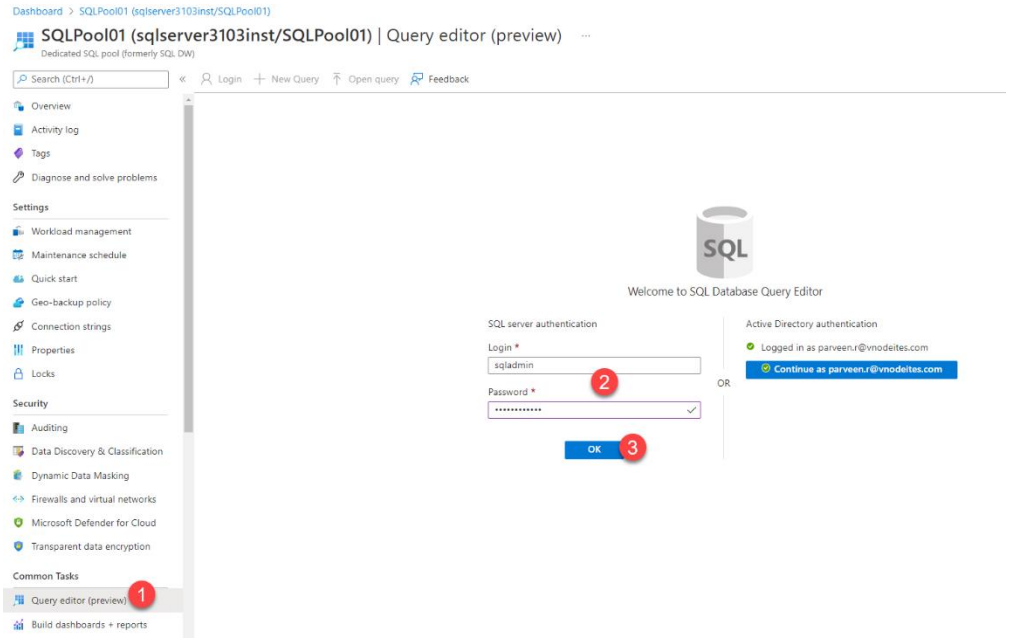
Tailwind Traders would like code-free options for data engineering tasks. Their motivation is driven by the desire to allow junior-level data engineers who understand the data but do not have a lot of development experience build and maintain data transformation operations. The other driver for this requirement is to reduce fragility caused by complex code with reliance on libraries pinned to specific versions, remove code testing requirements, and improve ease of long-term maintenance.

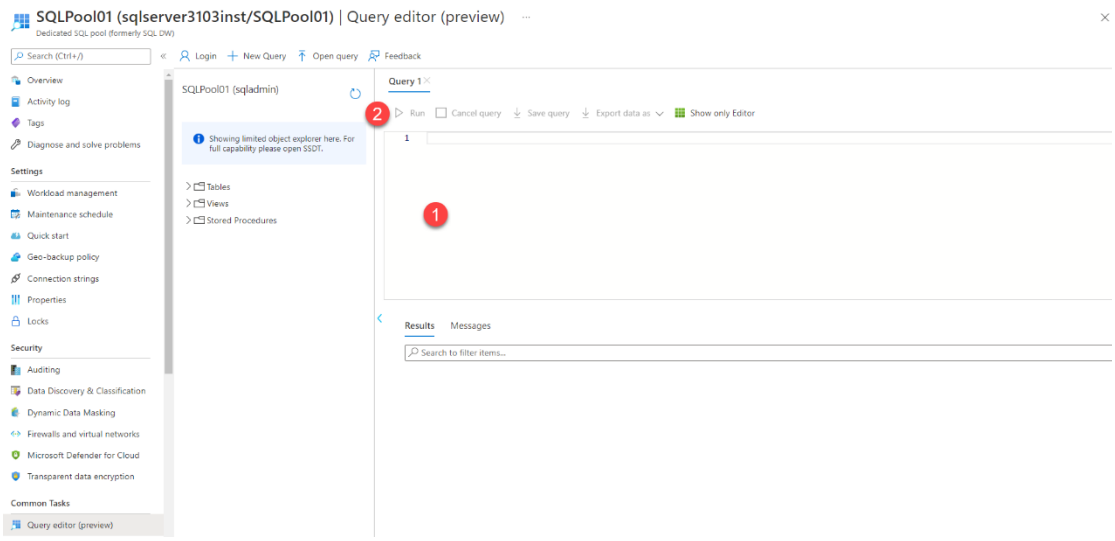
Their other requirement is to maintain transformed data in a data lake in addition to the dedicated SQL pool. This gives them the flexibility to retain more fields in their data sets than they otherwise store in fact and dimension tables, and doing this allows them to access the data when they have paused the dedicated SQL pool, as a cost optimization.

Create SQL table

The Mapping Data Flow we will build will write user purchase data to a dedicated SQL pool. Tailwind Traders does not yet have a table to store this data. We will execute a SQL script to create this table as a pre-requisite.

1. In Dedicated SQL pool (formerly SQL DW), navigate to the **Common Tasks** and then **Query Editor**



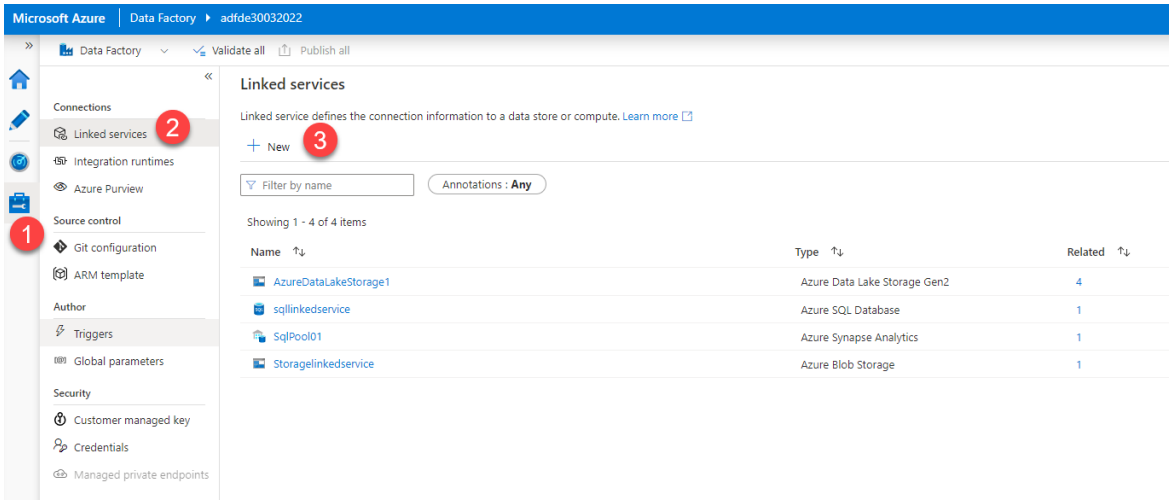


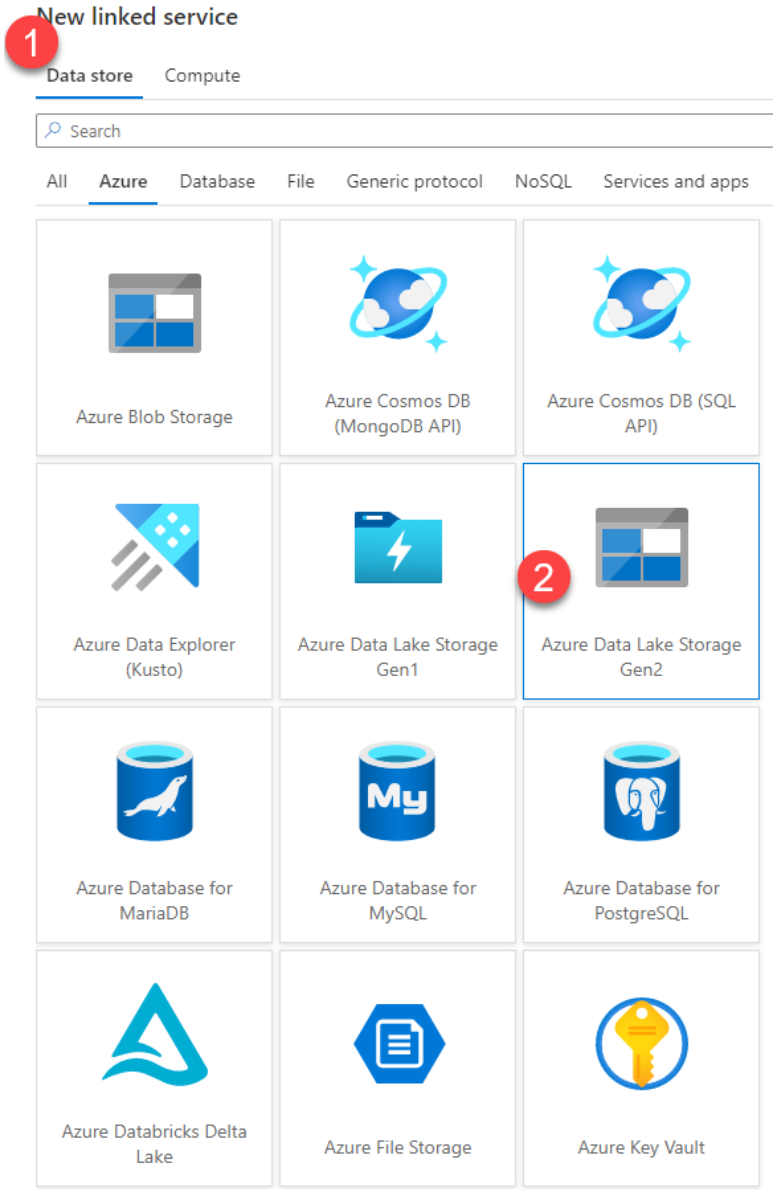
2. In the query window, create schema using the command and Run

```
create schem wwi

CREATE TABLE [wwi].[UserTopProductPurchases]
(
   [UserId] [int]  NOT NULL,
   [ProductId] [int]  NOT NULL,
   [ItemsPurchasedLast12Months] [int]  NULL,
   [IsTopProduct] [bit]  NOT NULL,
   [IsPreferredProduct] [bit]  NOT NULL
)
WITH
(
   DISTRIBUTION = HASH ( [UserId] ),
   CLUSTERED COLUMNSTORE INDEX
)

CREATE TABLE [wwi].[CampaignAnalytics]
(
   [Region] [nvarchar](50)  NOT NULL,
   [Country] [nvarchar](30)  NOT NULL,
   [ProductCategory] [nvarchar](50)  NOT NULL,
   [CampaignName] [nvarchar](500)  NOT NULL,
   [Revenue] [decimal](10,2)  NULL,
   [RevenueTarget] [decimal](10,2)  NULL,
   [City] [nvarchar](50)  NULL,
   [State] [nvarchar](25)  NULL
)
WITH
```

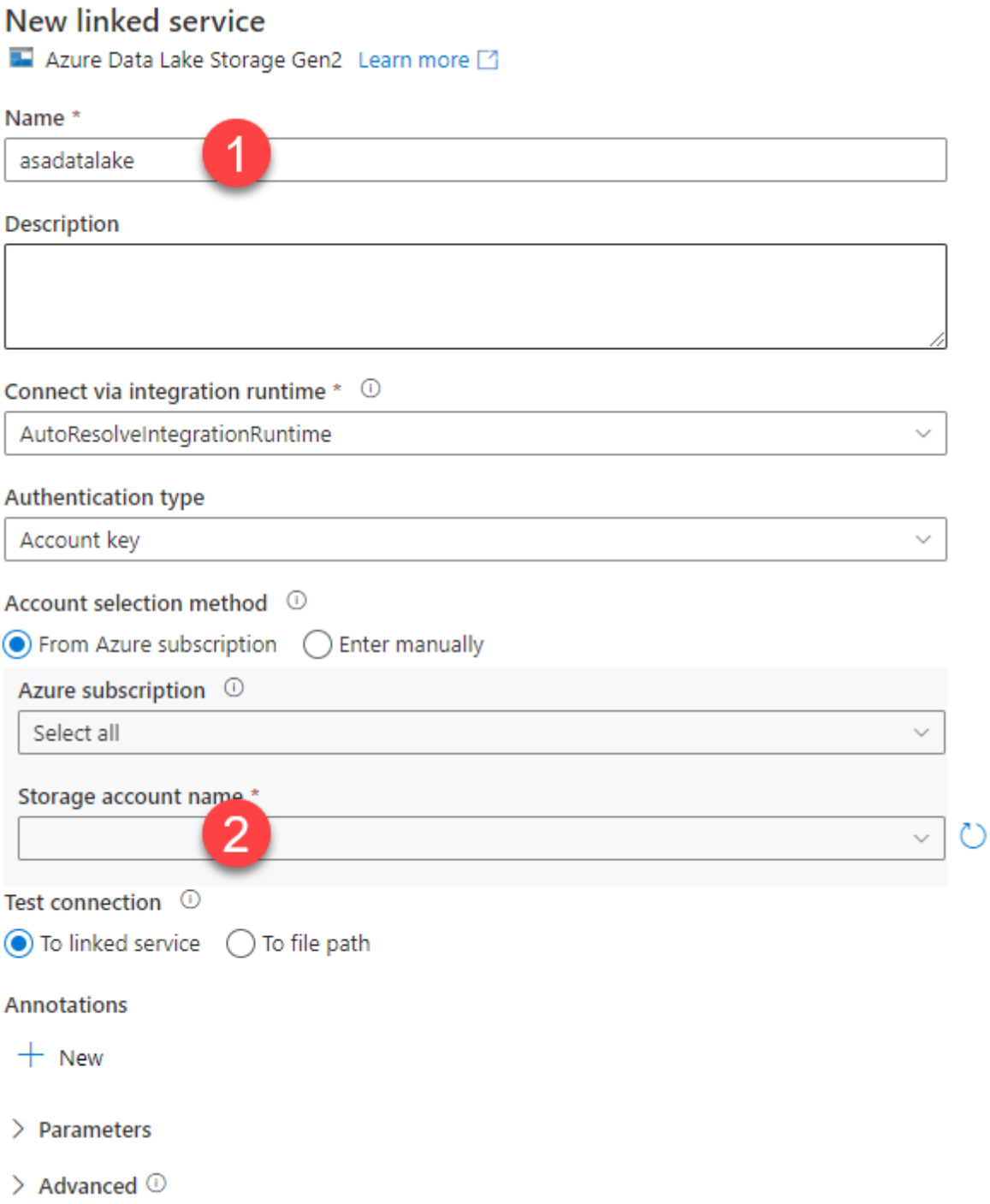
```
(
   DISTRIBUTION = HASH ( [Region] ),
   CLUSTERED COLUMNSTORE INDEX
)
```

Task 2: Create linked service

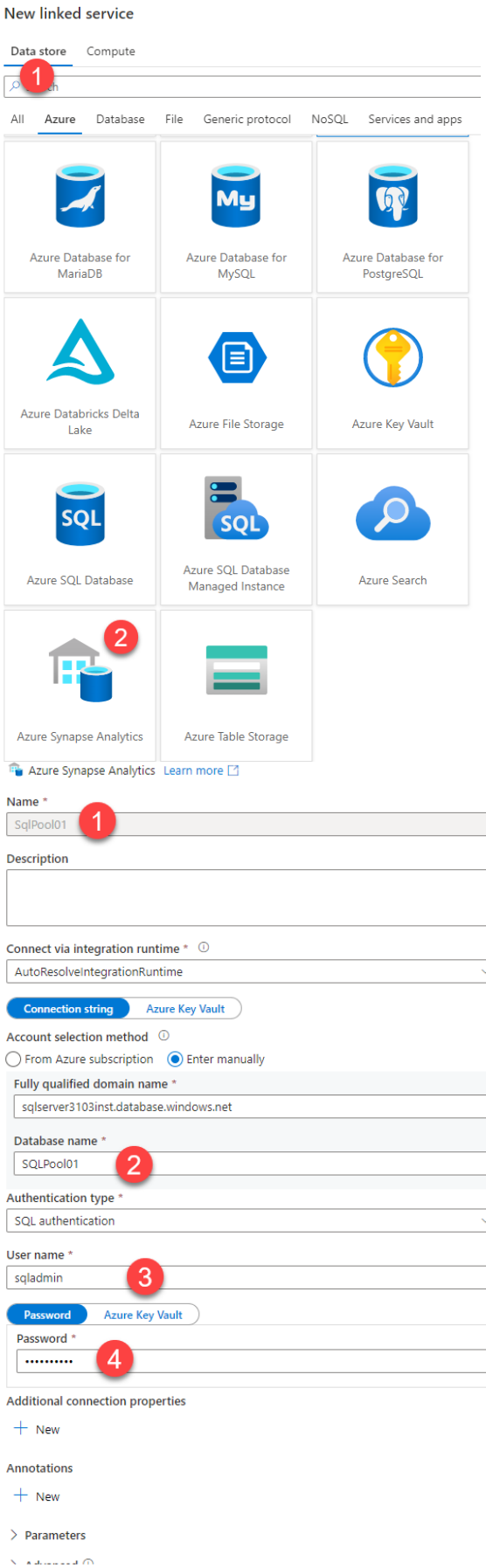




Create Linked service for Azure Data Lake Storage Gen2, and Synapse Analytics Workspace

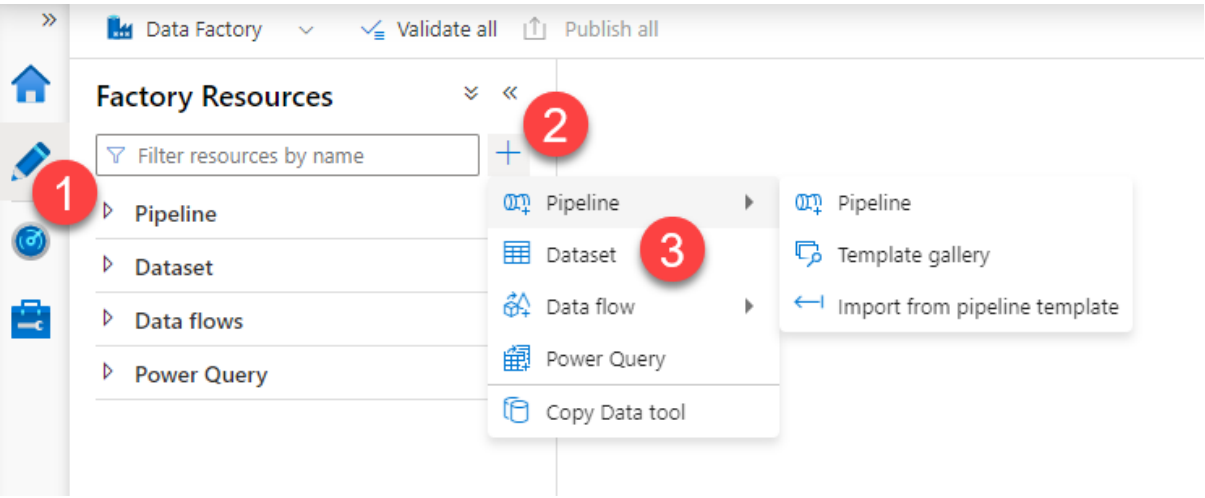


- **Linked service Name:** asadatalake.


New linked service
Data store
Compute
1
All
Azure
Database
File
Generic protocol
NoSQL
Services and apps
Azure Database for MariaDB
Azure Database for MySQL
Azure Database for PostgreSQL
Azure Databricks Delta Lake
Azure File Storage
Azure Key Vault
Azure SQL Database
Azure SQL Database Managed Instance
Azure Search
2
Azure Synapse Analytics
Azure Table Storage
Azure Synapse Analytics
Learn more
Name *
SqlPool01
1
Description
Connect via integration runtime *
AutoResolveIntegrationRuntime
Connection string
Azure Key Vault
Account selection method
From Azure subscription
Enter manually
Fully qualified domain name *
sqlserver3103inst.database.windows.net
Database name *
SQLPool01
2
Authentication type *
SQL authentication
User name *
sqladmin
3
Password
Azure Key Vault
Password *
4
Additional connection properties
New
Annotations
New
Parameters

Linked service Name: SqlPool01

Task 3: Create data sets



1. Configure the dataset as follows, then select **OK**:

- **Name**: Enter asal400_ecommerce_userprofiles_source.
- **Linked service**: Select the **asadatalake*xxxxxxx*** linked service.
- **File path**: Browse to the **wwi-02/online-user-profiles-02** path.
- **Import schema**: Select **From connection/store**.

2. Configure the dataset as follows, then select **OK**:

- **Name**: Enter asal400_wwi_campaign_analytics_asa.
- **Linked service**: Select the **SqlPool01** .
- **Table name**: Select **wwi.CampaignAnalytics**.
- **Import schema**: Select **From connection/store**.

3. Configure the dataset as follows, then select **OK**:

- **Name**: Enter asal400_wwi_usertopproductpurchases_asa.
- **Linked service**: Select the **SqlPool01**.
- **Table name**: Select **wwi.UserTopProductPurchases**.
- **Import schema**: Select **From connection/store**.

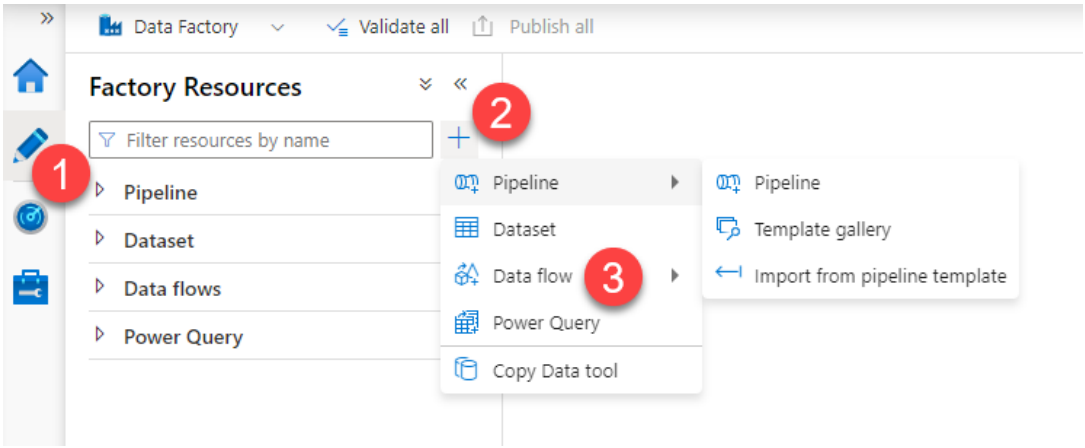
4. Configure the dataset as follows, then select **OK**:

- **Name**: Enter asal400_campaign_analytics_source.
- **Linked service**: Select the **asadatalake*xxxxxxx*** linked service.
- **File path**: Browse to **wwi-02/campaign-analytics/campaignanalytics.csv**.

- **First row as header**: Leave unchecked (we are skipping the header because there is a mismatch between the number of columns in the header and the number of columns in the data rows).
- **Import schema**: Select **From connection/store**.

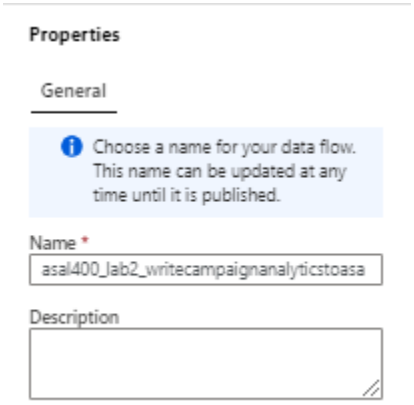
Task 3: Create campaign analytics data flow

1. Navigate to the **Author** hub.

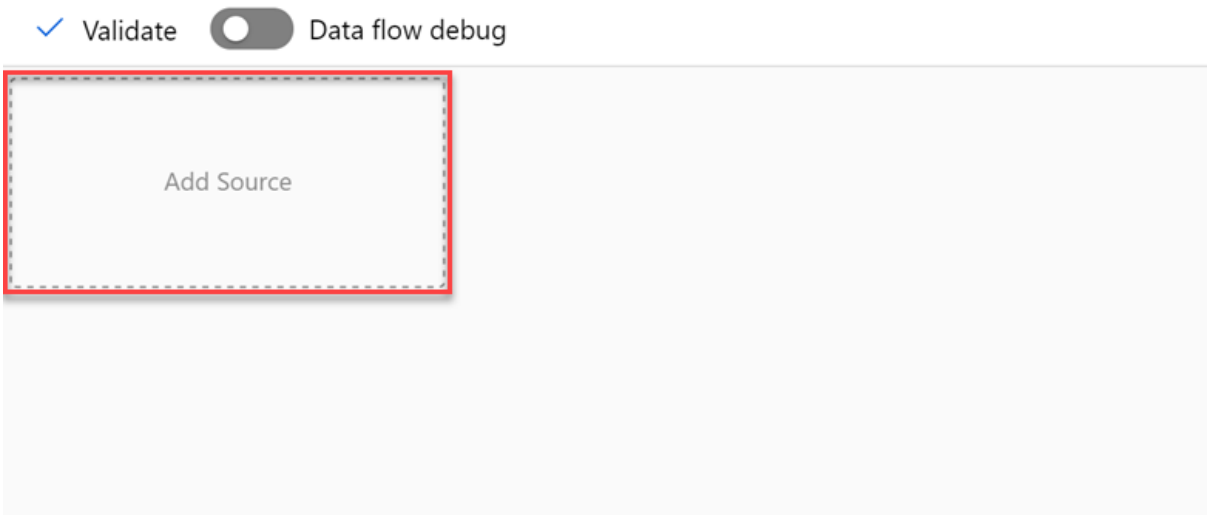


2.

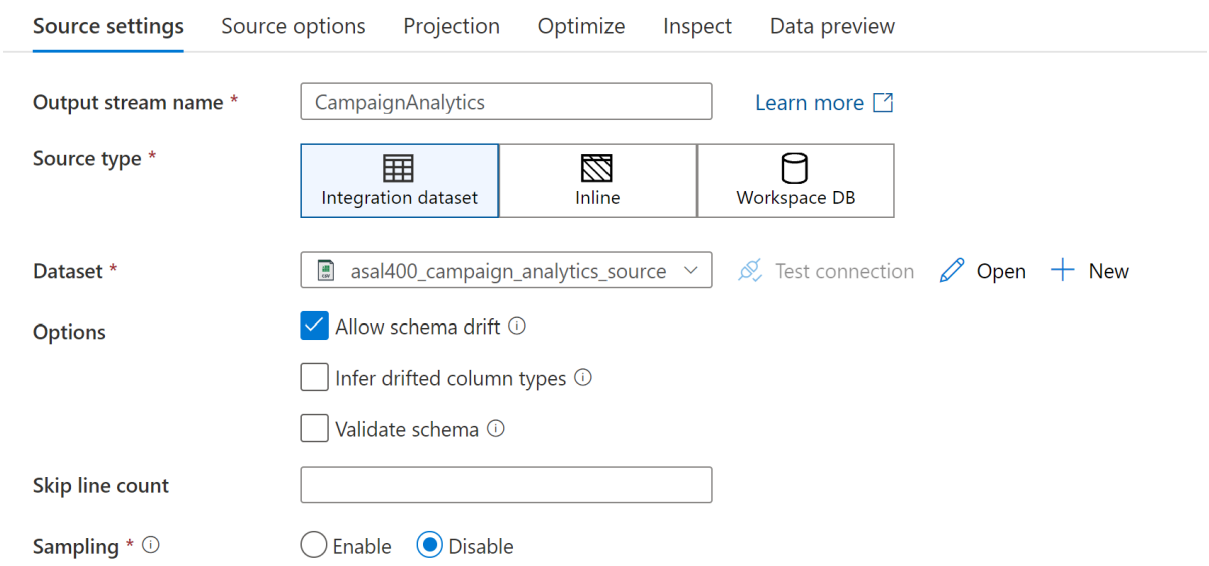
1. In the **General** settings of the **Properties** blade of the new data flow, change the **Name** to asal400_lab2_writecampaignanalyticstoasa.



2. Select **Add Source** on the data flow canvas (again, if a tip is displayed, close it.)



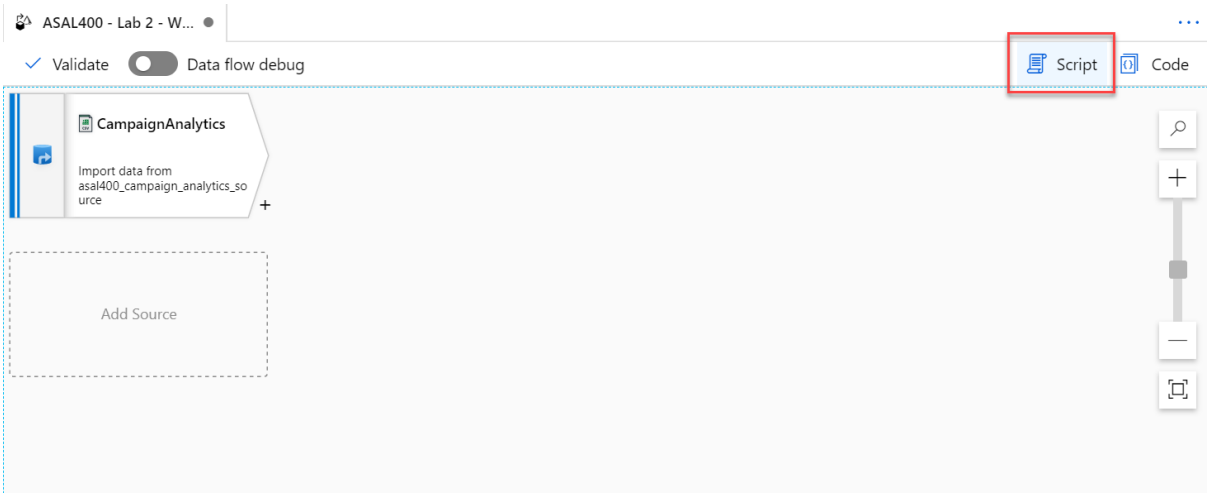
3. Under **Source settings**, configure the following:
    - **Output stream name**: Enter CampaignAnalytics.
    - **Source type**: Select **Integration dataset**.
    - **Dataset**: Select **asal400_campaign_analytics_source**.
    - **Options**: Select **Allow schema drift** and leave the other options unchecked.
    - **Skip line count**: Enter 1. This allows us to skip the header row which has two fewer columns than the rest of the rows in the CSV file, truncating the last two data columns.
    - **Sampling**: Select **Disable**.



When you create data flows, certain features are enabled by turning on debug, such as previewing data and importing a schema (projection). Due to the

amount of time it takes to enable this option, and to minimize resource consumption in the lab environment, we will bypass these features.

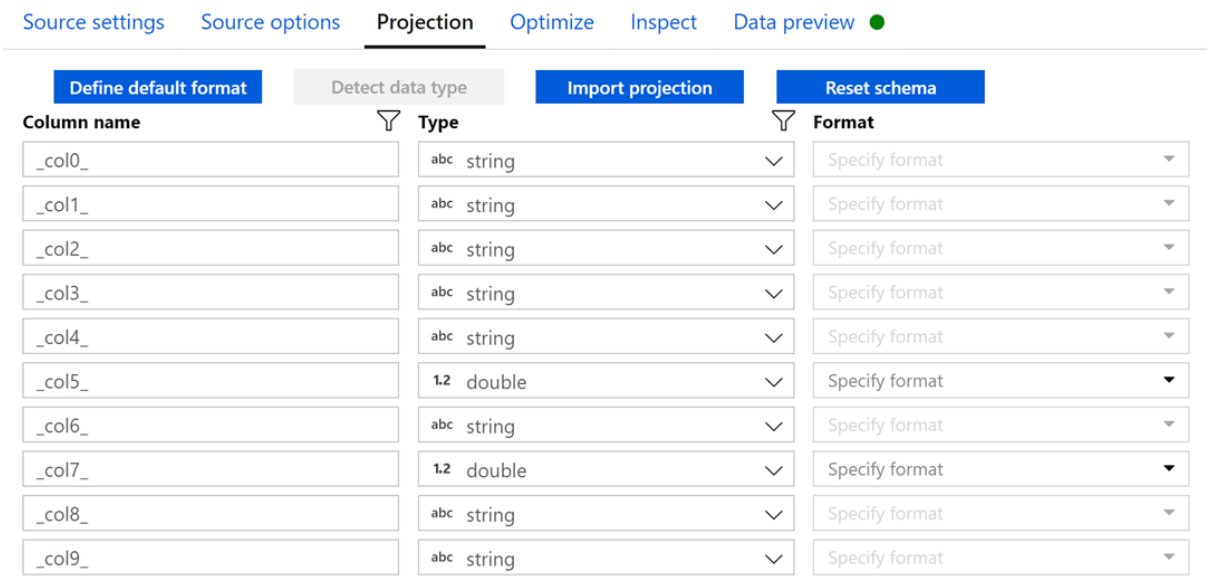
4. The data source has a schema we need to set. To do this, select **Script** above the design canvas.



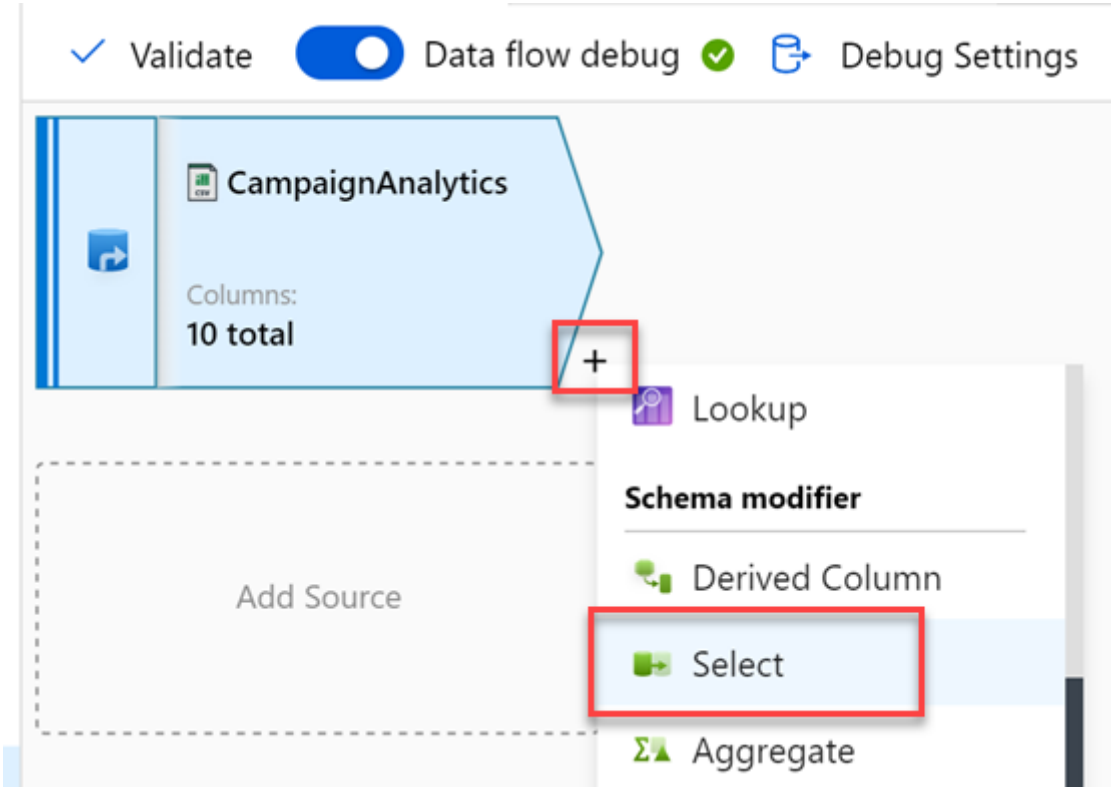
5. Replace the script with the following to provide the column mappings, then select **OK**:

```
source(output(
    {_col0_} as string,
    {_col1_} as string,
    {_col2_} as string,
    {_col3_} as string,
    {_col4_} as string,
    {_col5_} as double,
    {_col6_} as string,
    {_col7_} as double,
    {_col8_} as string,
    {_col9_} as string
  ),
  allowSchemaDrift: true,
  validateSchema: false,
  ignoreNoFilesFound: false,
                    skipLines: 1) ~> CampaignAnalytics
```

6. Select the **CampaignAnalytics** data source, then select **Projection**. The projection should display the following schema:



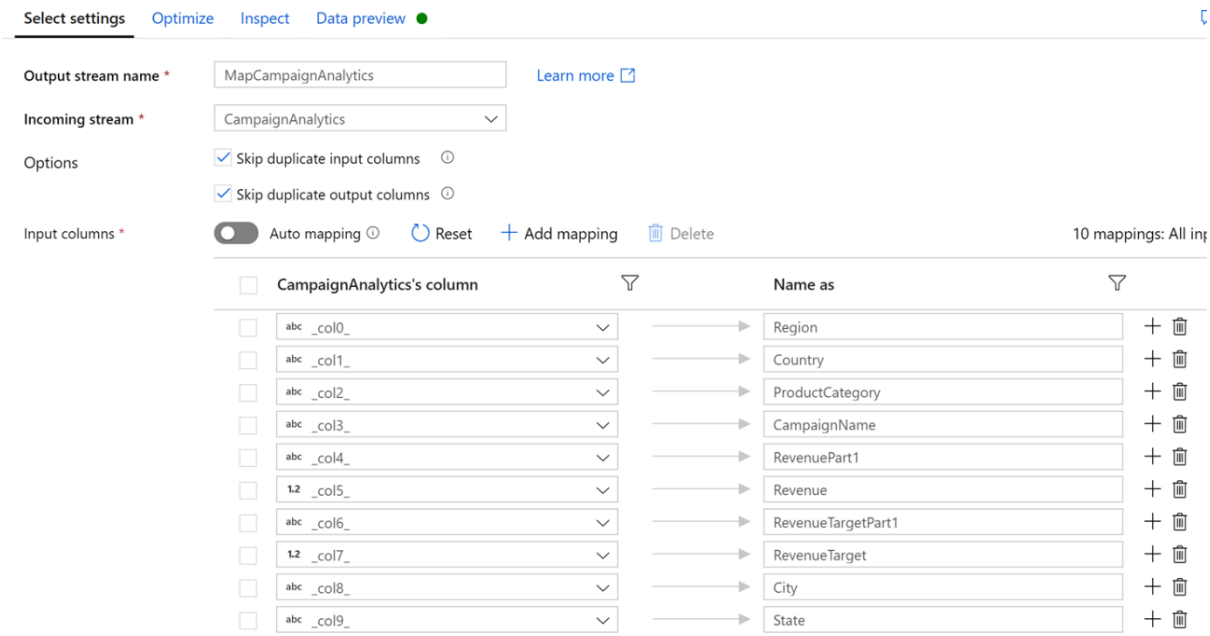
7. Select the **+** to the right of the **CampaignAnalytics** step, then select the **Select** schema modifier.



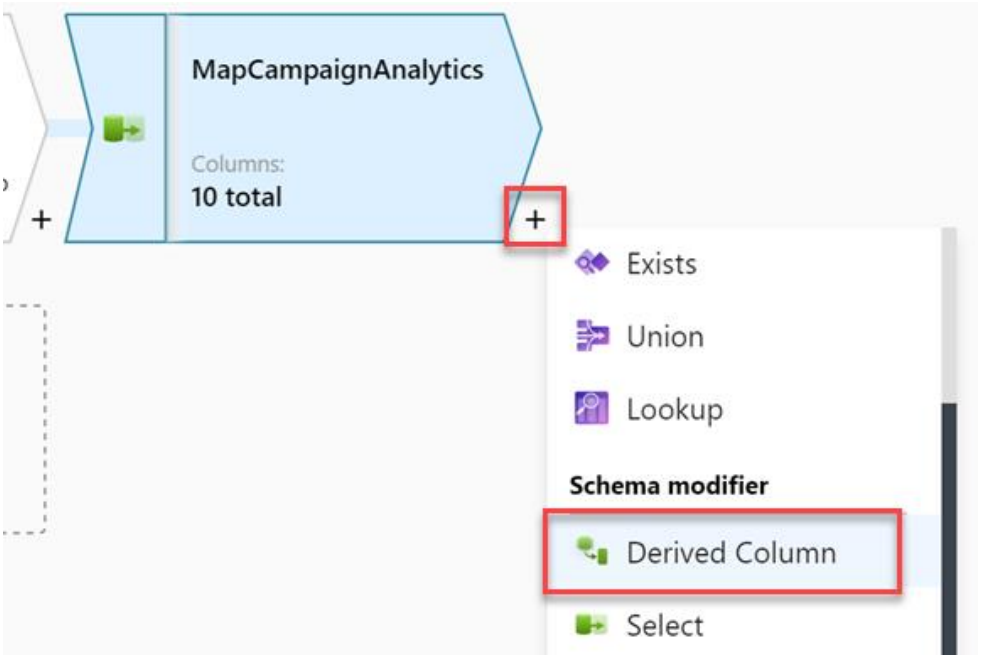
8. Under **Select settings**, configure the following:

   - **Output stream name**: Enter MapCampaignAnalytics.
   - **Incoming stream**: Select **CampaignAnalytics**.
   - **Options**: Check both options.
   - **Input columns**: make sure **Auto mapping** is unselected, then provide the following values in the **Name as** fields:

- Region
- Country
- ProductCategory
- CampaignName
- RevenuePart1
- Revenue
- RevenueTargetPart1
- RevenueTarget
- City
- State



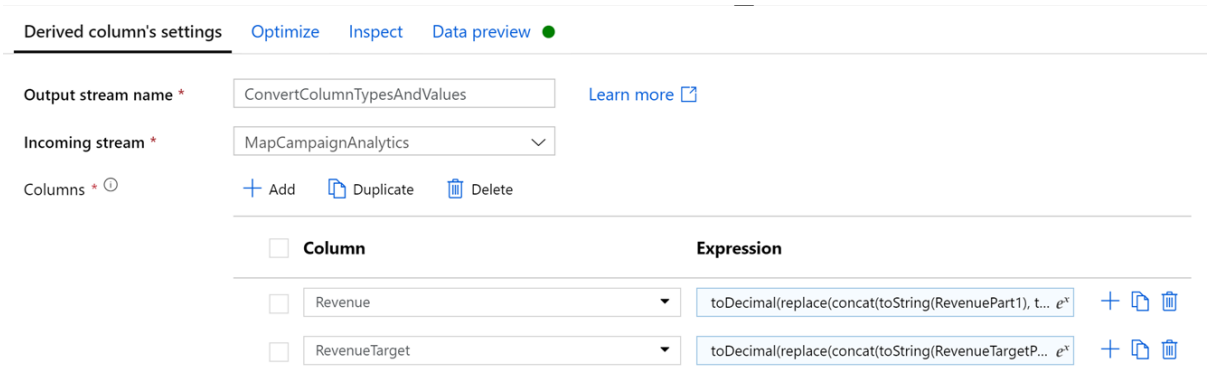
9. Select the **+** to the right of the **MapCampaignAnalytics** step, then select the **Derived Column** schema modifier.



10. Under **Derived column's settings**, configure the following:
    - **Output stream name**: Enter ConvertColumnTypesAndValues.
    - **Incoming stream**: Select **MapCampaignAnalytics**.
    - **Columns**: Provide the following information:

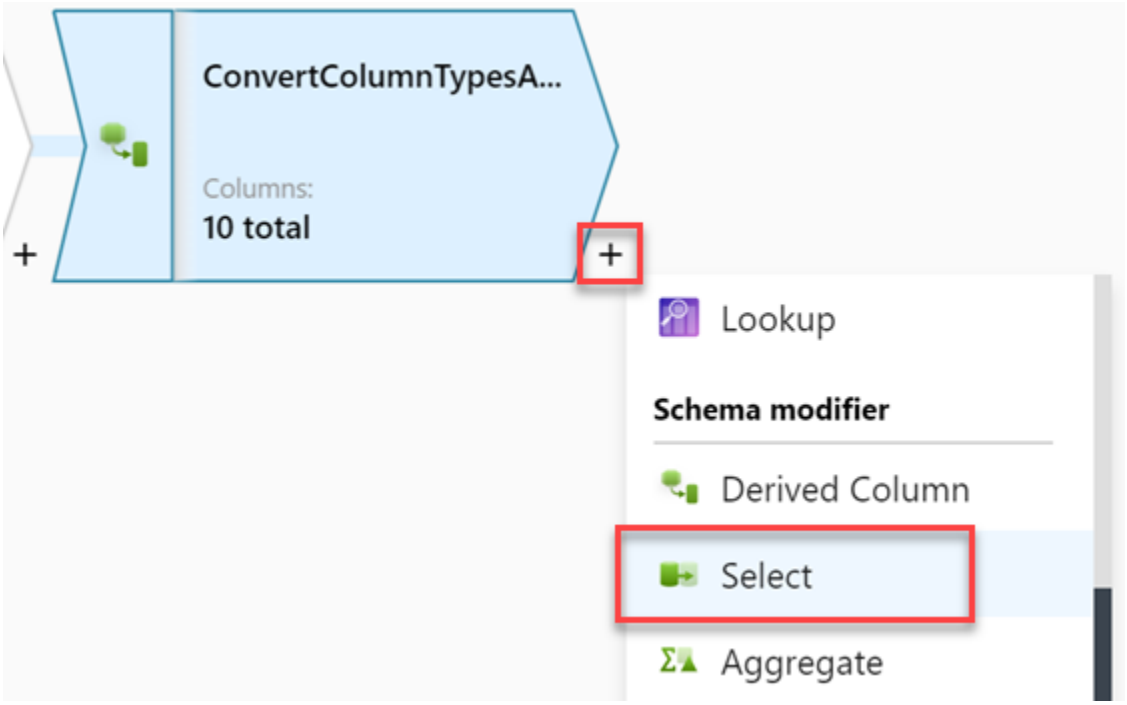
Column	Expression
Revenue	toDecimal(replace(concat(toString(RevenuePart1), toString(Revenue)), '\\', ''), 10, 2, '$###,###.##')
RevenueTarget	toDecimal(replace(concat(toString(RevenueTargetPart1), toString(RevenueTarget)), '\\', ''), 10, 2, '$###,###.##')

11. **Note**: To insert the second column, select **+ Add** above the Columns list, then select **Add column**.

12. 

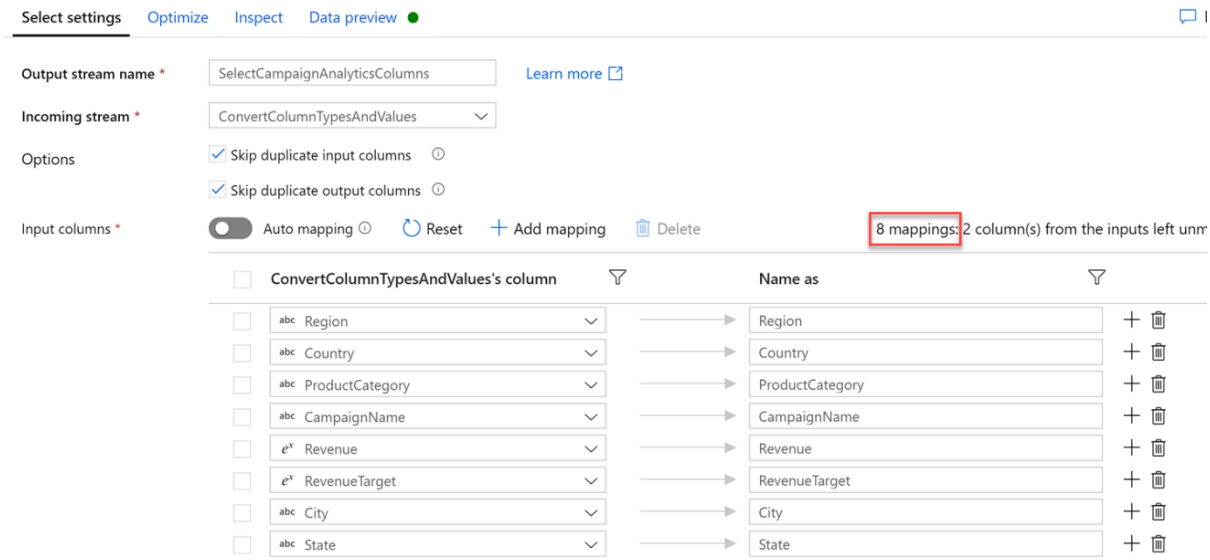
13. The expressions you defined will concatenate and clean-up the **RevenuePart1** and **Revenue** values and the **RevenueTargetPart1** and **RevenueTarget** values.

14. Select the **+** to the right of the **ConvertColumnTypesAndValues** step, then select the **Select** schema modifier from the context menu.

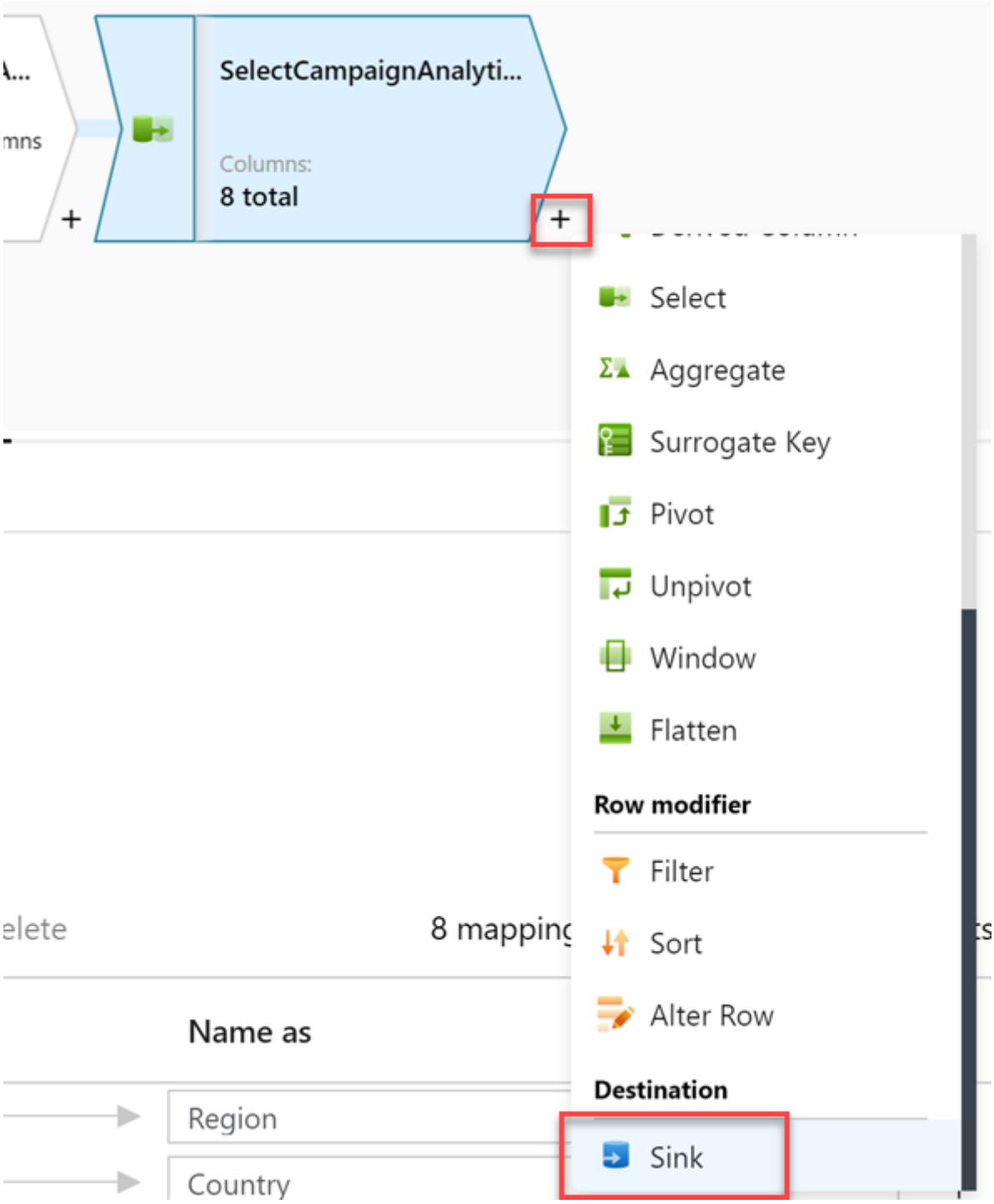


15. Under **Select settings**, configure the following:

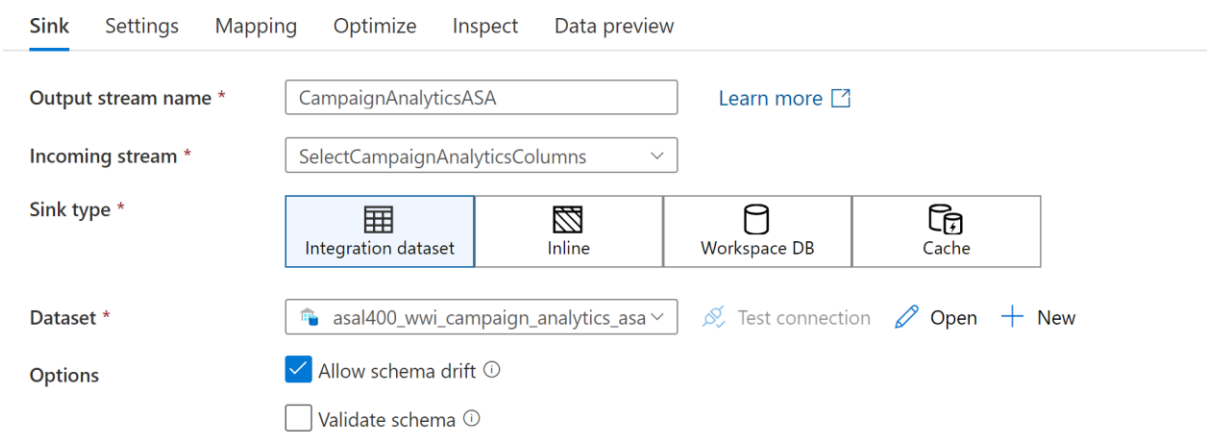
    - **Output stream name**: Enter SelectCampaignAnalyticsColumns.
    - **Incoming stream**: Select **ConvertColumnTypesAndValues**.
    - **Options**: Check both options.
    - **Input columns**: make sure **Auto mapping** is unchecked, then **Delete RevenuePart1** and **RevenueTargetPart1**. We no longer need these fields.



16. Select the **+** to the right of the **SelectCampaignAnalyticsColumns** step, then select the **Sink** destination.

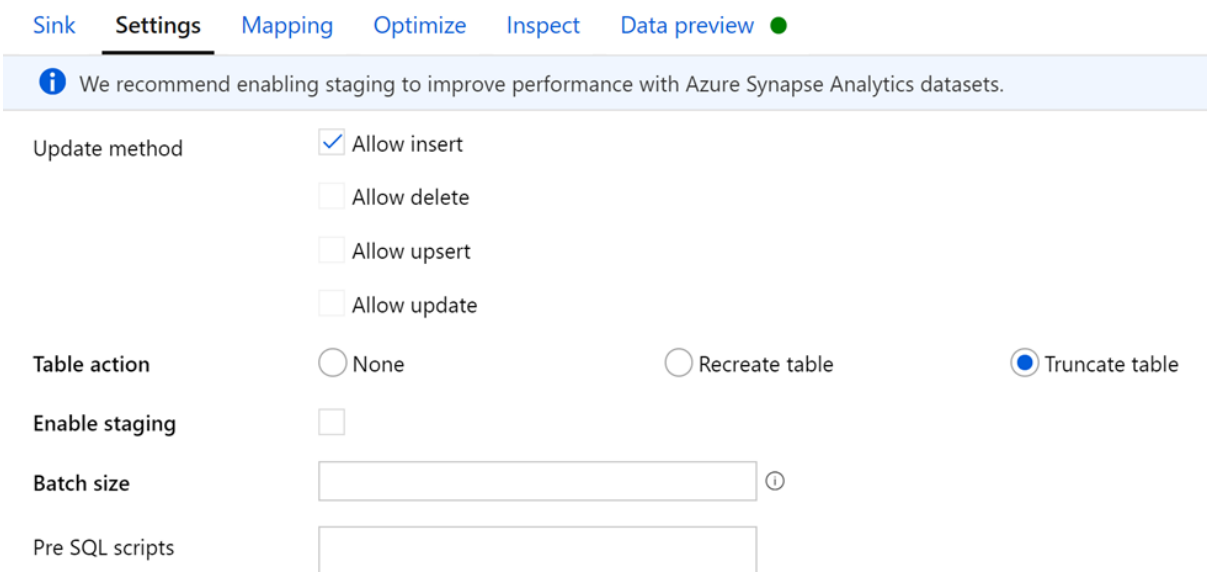


17. Under **Sink**, configure the following:
    - **Output stream name**: Enter CampaignAnalyticsASA.
    - **Incoming stream**: Select **SelectCampaignAnalyticsColumns**.
    - **Sink type**: Select **Integration dataset**.
    - **Dataset**: Select **asal400_wwi_campaign_analytics_asa**.
    - **Options**: Check **Allow schema drift** and uncheck **Validate schema**.

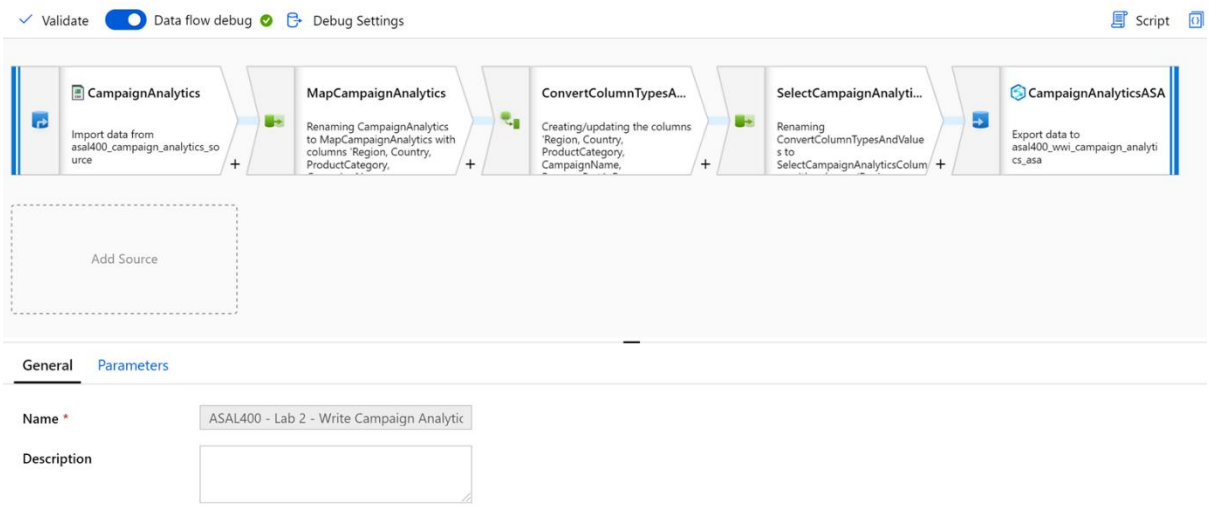


18. On the **Settings** tab, configure the following options:

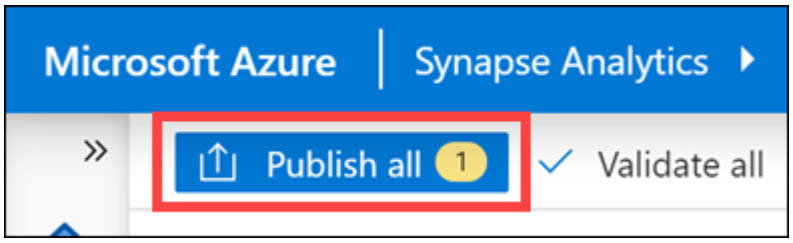
    - **Update method**: Check **Allow insert** and leave the rest unchecked.
    - **Table action**: Select **Truncate table**.
    - **Enable staging**: Uncheck this option. The sample CSV file is small, making the staging option unnecessary.



19. Your completed data flow should look similar to the following:



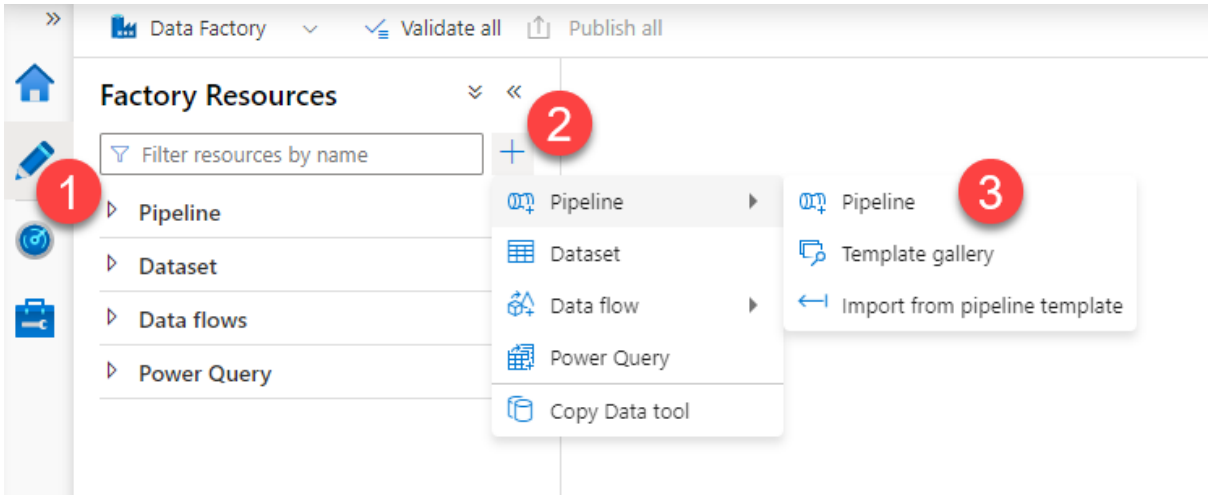
20. Select **Publish all** then **Publish** to save your new data flow.



Task 4: Create campaign analytics data pipeline

In order to run the new data flow, you need to create a new pipeline and add a data flow activity to it.

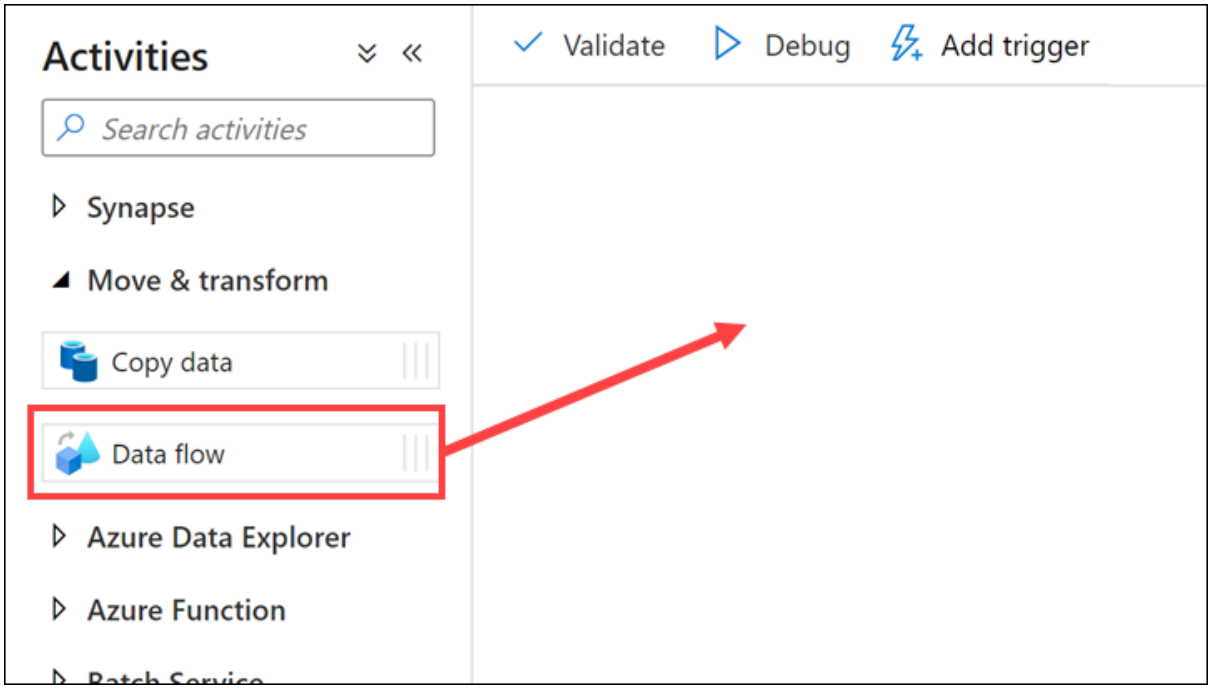
1. Navigate to the **Author** hub.



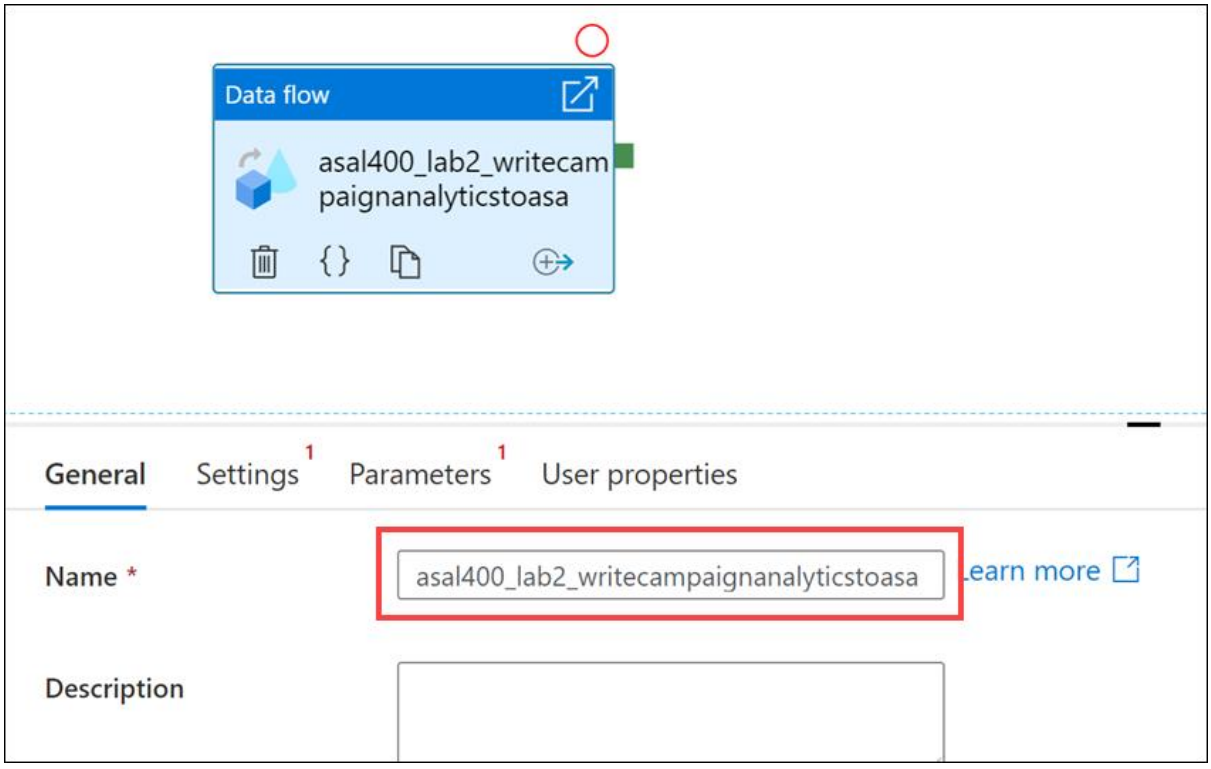
2. In the **+** menu, select **Pipeline** to create a new pipeline.

3. In the **General** section of the **Properties** blade for the new pipeline, enter the following **Name**: Write Campaign Analytics to ASA.

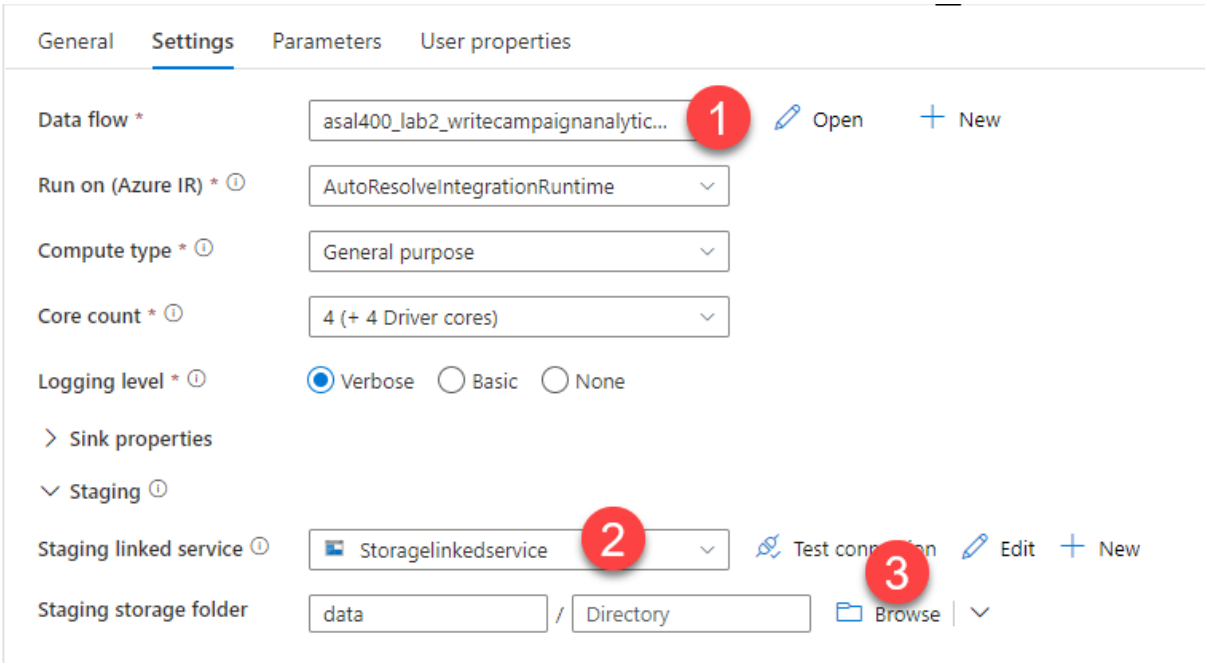
4. Expand **Move & transform** within the Activities list, then drag the **Data flow** activity onto the pipeline canvas.



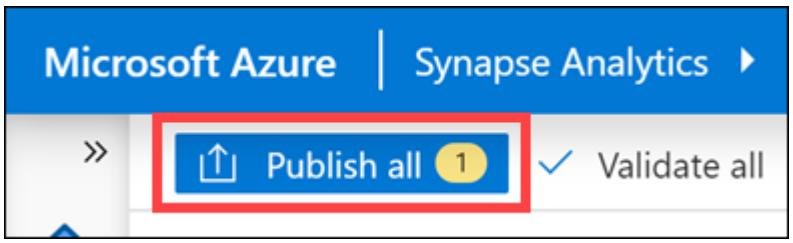
5. On the **General** tab for the data flow (beneath the pipeline canvas), set the **Name** to asal400_lab2_writecampaignanalyticstoasa.



6. Select the **Settings** tab; and then, in the **Data flow** list, select **asal400_lab2_writecampaignanalyticstoasa** . Under staging linked services select Storage account, select browse and select a container for staging

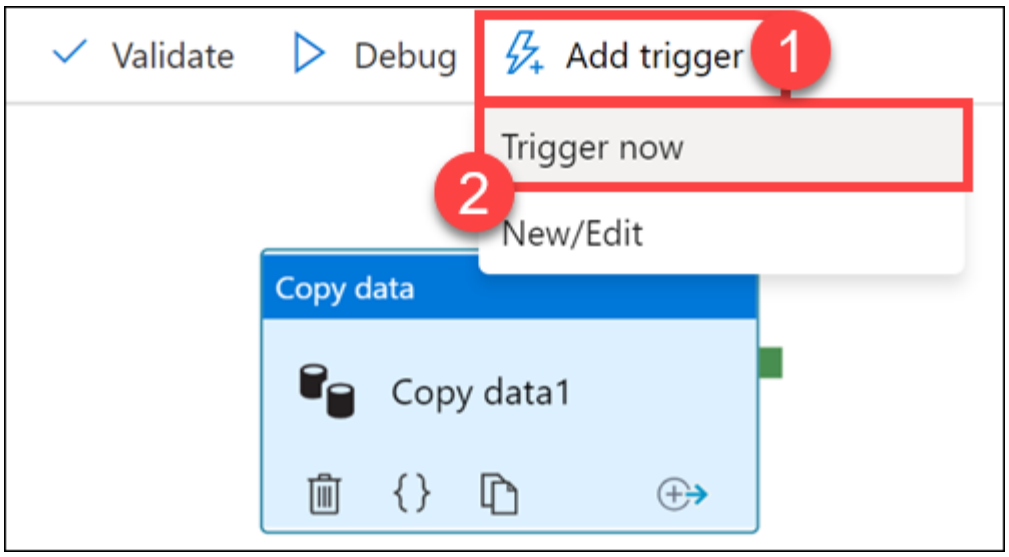


7. Select **Publish all** to save your new pipeline, and then select **Publish**.

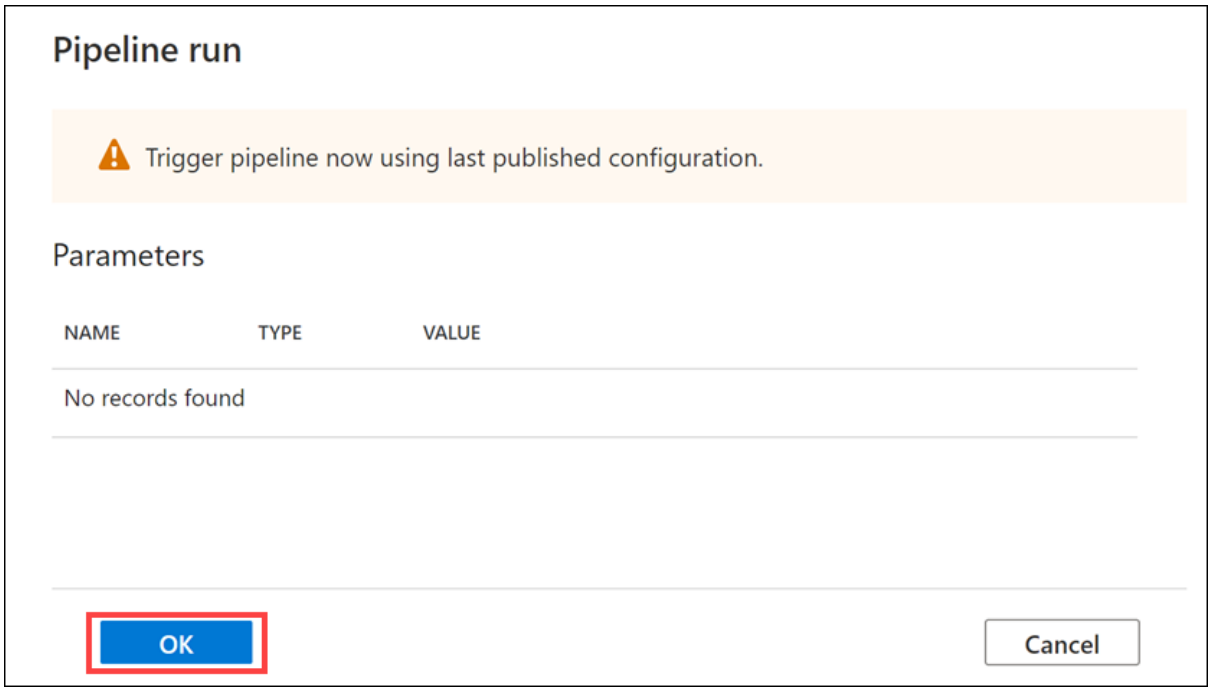


Task 5: Run the campaign analytics data pipeline

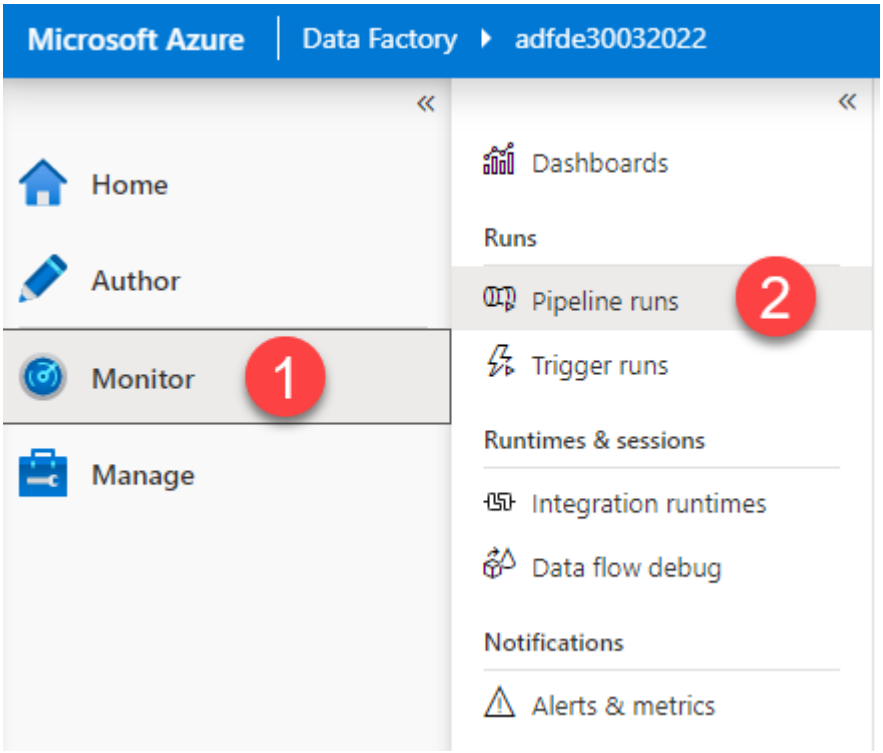
1. Select **Add trigger**, and then select **Trigger now** in the toolbar at the top of the pipeline canvas.



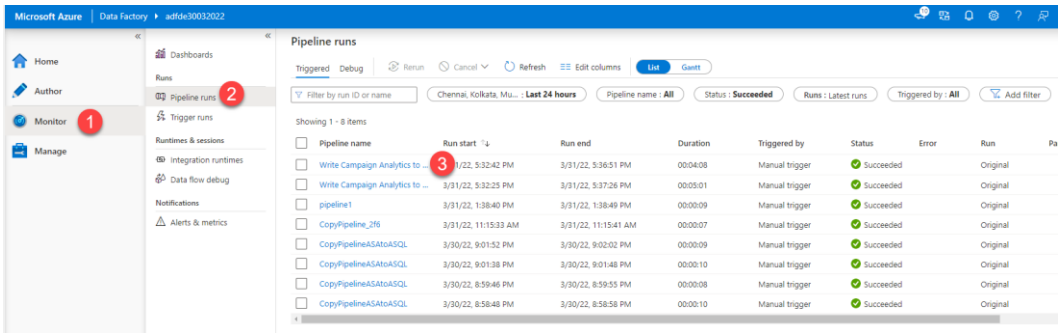
2. In the **Pipeline run** pane, select **OK** to start the pipeline run.



3. Navigate to the **Monitor** hub.

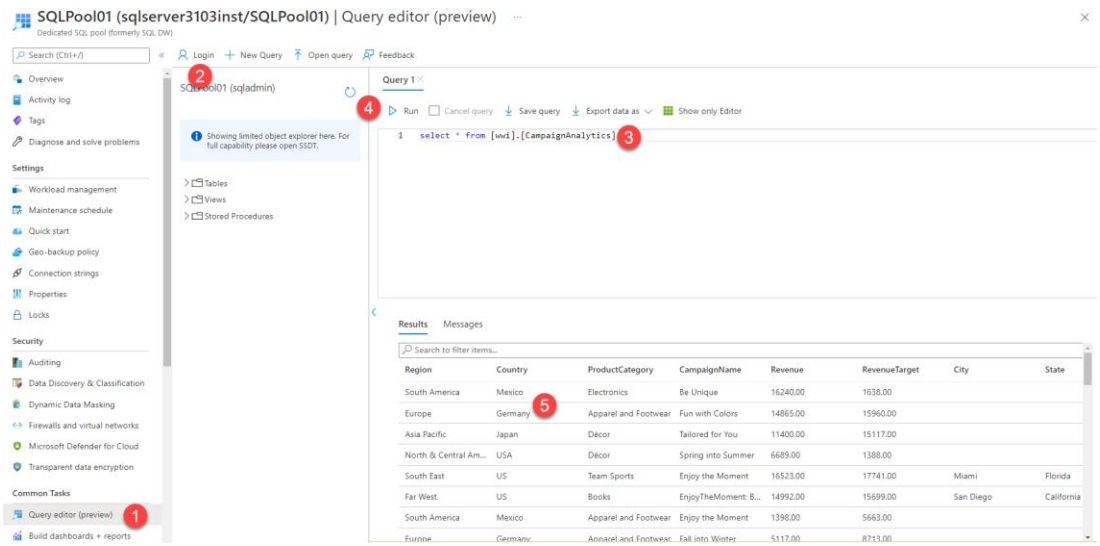


4. Wait for the pipeline run to successfully complete, which will take some time. You may need to refresh the view.

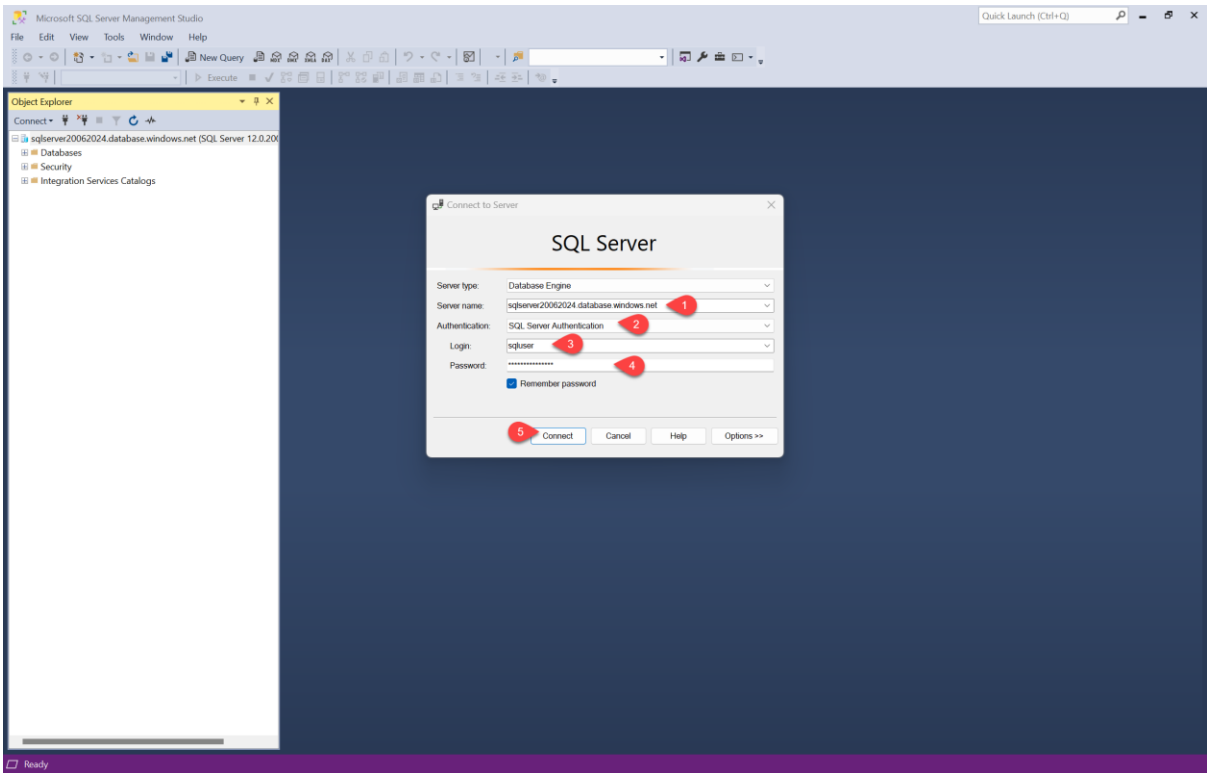


Task 6: View campaign analytics table contents

Now that the pipeline run is complete, let's take a look at the SQL table to verify the data successfully copied.

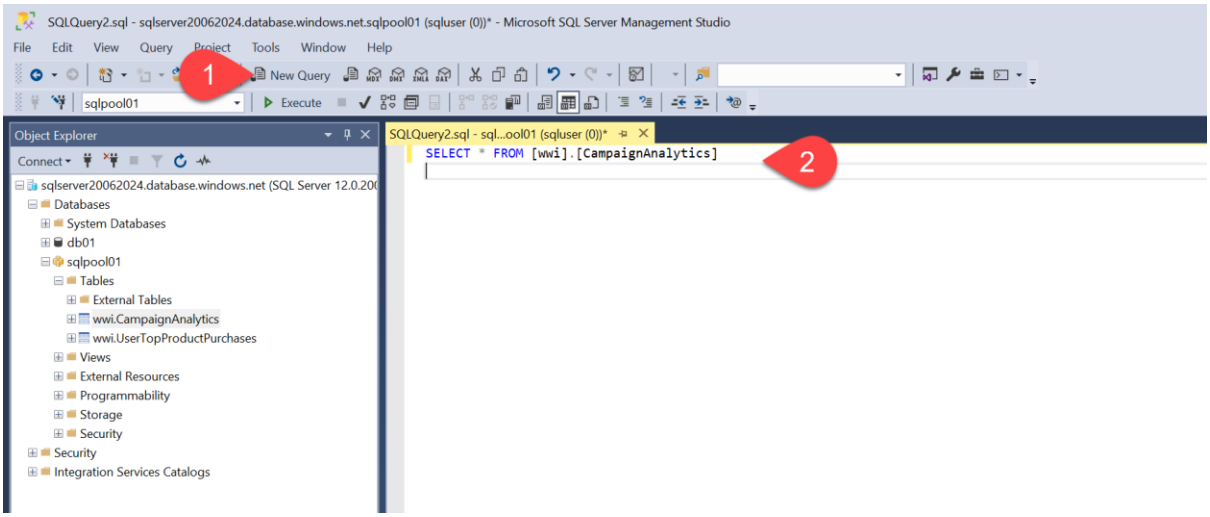


We can use the SSMS installed on local computer to test this:
SQL Server Name: sqlserver20062024.database.windows.net
Username: sqluser
Password: Pa55w.rd123456
Database Name: sqlpool01



Write New Query and verify the result:

```
SELECT * FROM [wwi].[CampaignAnalytics]
```


SQLQuery2.sql - sqlserver20062024.database.windows.net.sqlpool01 (sqluser (0))* - Microsoft SQL Server Management Studio
File
Edit
View
Query
Project
Tools
Window
Help
1
New Query
sqlpool01
Execute
Object Explorer
Connect
sqlserver20062024.database.windows.net (SQL Server 12.0.20
Databases
System Databases
db01
sqlpool01
Tables
External Tables
wwi.CampaignAnalytics
wwi.UserTopProductPurchases
Views
External Resources
Programmability
Storage
Security
Security
Integration Services Catalogs
SQLQuery2.sql - sql...ool01 (sqluser (0))*
SELECT * FROM [wwi].[CampaignAnalytics]
2