QC Your RDBMS Data Using Dictionary Tables

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QC Data

- ETL process
- data summarization
- test data creation
- verifying data is a good thing!

QC Data

- rudimentary data QC
  - continuous
    - numeric variables
      - eg. weight, balance
    - count, min, max, sum, mean, stddev
    - not all numeric data are *really* numbers
  - categorical
    - frequency distributions

QC Data

- what’s involved?
  - separate data into three categories
    - continuous
    - categorical
    - junk
  - generate numeric analysis
  - generate frequency distributions

QC Data

- lazy programmers
  - don’t want to hard-code
  - don’t want to code
  - don’t want to think.... too much
  - do want to be productive
- can we let the data drive the process?

Data Driven Code

```
proc summary data = acct_data print sum;
  class state_cd ;

  var chequing_bal savings_bal ;
run;
```

- **next month, visa_bal, mortgage_bal**
- **month after, loc_bal, invest_bal**
- **month after ….**

Data Driven Code

- SAS has “dictionary” data
  - special libname – dictionary
    - only useful in PROC SQL
  - sashelp.v* views
    - available in PROC SQL and data step
- let the data drive the code

Data Driven Code

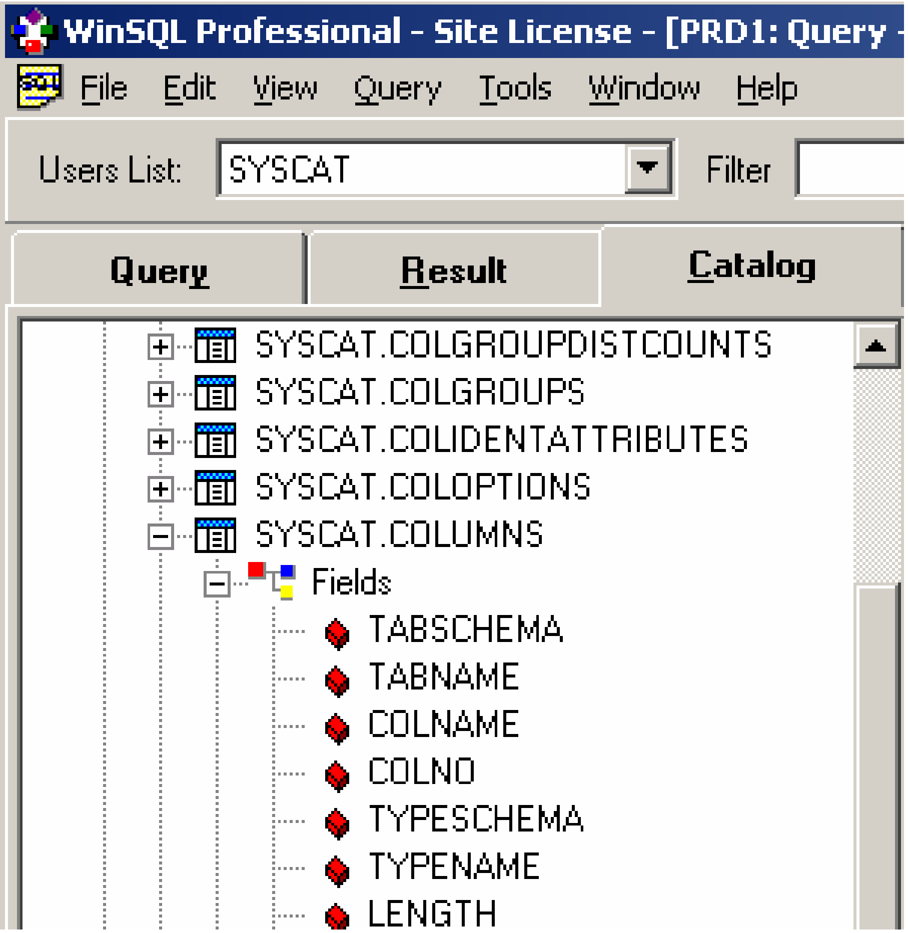
```
proc sql;
  select name
    into :bal_vars separated by ' '
    from sashelp.vcolumn
   where libname = 'WORK'
     and memname = 'ACCT_DATA'
     and scan(name,-1,'_') = 'bal' ;
quit;
```

Data Driven Code

```
proc summary data = acct_data print sum;
  class state_cd ;

  var &bal_vars ;
run;
```

```
SYMBOLGEN:  Macro variable BAL_VARS
  resolves to chequing_bal savings_bal
  visa_bal mortgage_bal
```

RDBMS Dictionary Data



Users List: SYSCAT

```
SYSCAT.COLGROUPDISTCOUNTS
SYSCAT.COLGROUPS
SYSCAT.COLIDENTATTRIBUTES
SYSCAT.COLOPTIONS
SYSCAT.COLUMNS
    Fields
        TABSCHEMA
        TABNAME
        COLNAME
        COLNO
        TYPESCHEMA
        TYPENAME
        LENGTH
```

DB2 Dictionary Data

```sql
  select tabschema, tabname, colname,
         typename
    from syscat.columns
   where tabschema = 'DROOGH2'
     and tabname   = 'QC_TEST'
order by typename, colname
     ;
```

DB2 Dictionary Data

```
TABSCHEMA TABNAME  COLNAME                  TYPENAME
--------- -------- ------------------------ --------
DROOGH2   QC_TEST  ACCT_ID                  BIGINT
DROOGH2   QC_TEST  CTD_CREDIT_AM            DECIMAL
DROOGH2   QC_TEST  CTD_DEBIT_AM             DECIMAL
DROOGH2   QC_TEST  DISPUT_AM                DECIMAL
DROOGH2   QC_TEST  CTD_CREDIT_CT            INTEGER
DROOGH2   QC_TEST  CTD_DEBIT_CT             INTEGER
DROOGH2   QC_TEST  ACCT_FAMILY_CD           SMALLINT
DROOGH2   QC_TEST  ACCT_SUBFAM_CD           SMALLINT
DROOGH2   QC_TEST  ACCT_TYPE_ID             SMALLINT
DROOGH2   QC_TEST  APPL_SUFFIX_NO           SMALLINT
DROOGH2   QC_TEST  CLIENT_PRODCT_CD         SMALLINT
DROOGH2   QC_TEST  TBAL_CD                  SMALLINT
DROOGH2   QC_TEST  ACCT_TYPE_MN             VARCHAR
DROOGH2   QC_TEST  ACCT_TYPE_NA             VARCHAR
```

Teradata Dictionary Data

```
  select tablename, columnname,
          columntype
    from dbc.columns
   where databasename = ‘SANDBOX'
     and tablename     = 'QC_TEST'
order by columntype, columnname
     ;
```

RDBMS Dictionary Data

- RDBMS metadata extraction
  - database specific syntax
  - argh...
- SAS rules !
  - RDBMS libnames
  - proc contents

RDBMS Dictionary Data

```
options sastrace=',,,d'
  sastraceloc=saslog nostsuffix;

libname _db2 db2 database=test
  schema=droogh2;

proc contents data = _db2.qc_test;
run;
```

RDBMS Dictionary Data

```
DB2: AUTOCOMMIT is NO for connection 0
516  options sastrace=',,,d'
  sastraceloc=saslog nostsuffix;
518  libname _db2 db2 database=test
  schema=droogh2;
NOTE: Libref _DB2 was successfully
  assigned as follows:
      Engine:        DB2
      Physical Name: test
```

RDBMS Dictionary Data

```
DB2: AUTOCOMMIT turned ON for connection id 0
DB2_1: Prepared:
SELECT * FROM droogh2.QC_TEST FOR READ ONLY
DB2: COMMIT performed on connection 0.
520  proc contents data = _db2.qc_test;
521  run;
NOTE: PROCEDURE CONTENTS used :
```

RDBMS Dictionary Data

- SQLNumResultCols
  - number of columns in table
- SQLDescribeCol
  - column name, type, length etc.
- SQLColAttribute
  - type specific column attributes

RDBMS Dictionary Data

```
The CONTENTS Procedure

Data Set Name        _DB2.QC_TEST   Observations          .
Member Type          DATA           Variables             14
Engine               DB2            Indexes               0
Created              .              Observation Length    0
Last Modified        .              Deleted Observations  0
Protection                          Compressed            NO
Data Set Type                       Sorted                NO
```

RDBMS Dictionary Data

```
                    Alphabetic List of Variables and Attributes

 #    Variable            Type    Len    Format     Informat    Label

12    ACCT_FAMILY_CD      Num       8    11.        11.         ACCT_FAMILY_CD
 1    ACCT_ID             Num       8    20.        20.         ACCT_ID
13    ACCT_SUBFAM_CD      Num       8    11.        11.         ACCT_SUBFAM_CD
10    ACCT_TYPE_ID        Num       8    11.        11.         ACCT_TYPE_ID
11    ACCT_TYPE_MN        Char     15    $15.       $15.        ACCT_TYPE_MN
14    ACCT_TYPE_NA        Char     23    $23.       $23.        ACCT_TYPE_NA
 3    APPL_SUFFIX_NO      Num       8    11.        11.         APPL_SUFFIX_NO
 2    CLIENT_PRODCT_CD    Num       8    11.        11.         CLIENT_PRODCT_CD
 9    CTD_CREDIT_AM       Num       8    15.2       15.2        CTD_CREDIT_AM
 8    CTD_CREDIT_CT       Num       8    11.        11.         CTD_CREDIT_CT
 7    CTD_DEBIT_AM        Num       8    15.2       15.2        CTD_DEBIT_AM
 6    CTD_DEBIT_CT        Num       8    11.        11.         CTD_DEBIT_CT
 5    DISPUT_AM           Num       8    15.2       15.2        DISPUT_AM
 4    TBAL_CD             Num       8    11.        11.         TBAL_CD
```

QC Data

- define input table
- identify variables requiring numerical analysis
- identify variables requiring frequency distributions
- do the deed!

qc_db_data.sas

- macro is self-documenting

  `%qc_db_data(?)`

- generates documentation in log
  - purpose
  - parms and their values
  - output

qc_db_data.sas

```
=================================================================================================
%qc_db_data( help, lib=, table=, drop_columns=, keep_columns=, by_vars=, where=, freq_limit = 100)

QC / analyze the RDBMS table specified, creating frequency distributions or min, max, mean,
stddev and sum depending on the column type and granularity of the data in the table.

Parms:
   help             any value in the sole positional parameter provides this help text
   lib              SAS libref via RDBMS engine for schema that contains &table
   table            RDBMS table to be analyzed, MUST be sorted by &by_vars ( if specified )
   drop_columns     comma-delimited, single-quoted column names to be IGNORED in analysis,
                    - must use %str('col1','col2') when specifying multiple column names
                    - always specify 'acct_id', 'cust_id' type fields in this parm
   keep_columns     comma-delimited, single-quoted column names to be considered for analysis,
                    - must use %str('col1','col2') when specifying multiple column names
   by_vars          comma-delimited, single-quoted column names for BY groups
                    - must use %str('col1','col2') when specifying multiple column names
   where            WHERE clause to apply to input &schema..&table to focus analysis
   freq_limit       upper limit of number of distinct values used to decide which vars generate
                    frequence distributions, default is 100 distinct values
                    - all columns with <= &freq_limit distinct values will generate freq dist
                    - num columns with >  &freq_limit distinct values will generate num analysis
```

qc_db_data.sas

Macro logic outlined below:

1. Derive table columns using PROC CONTENTS data=&lib..&table, incorporate &drop_column and &keep_column criteria
2. count distinct values for all selected fields
3. numeric fields where count of distinct values > &freq_limit, create min/max/stddev/sum stats
4. run frequency distribution on any fields that have <= &freq_limit distinct values
5. if &by_vars are specified, all stats will be created with the BY groups specified
6. create datasets of final results in remwork._qc_continuous_data and remwork._qc_categorical_data

Sample Invocation:

```
libname rdbms <RDBMS engine> <RDBMS connection particulars>;

%qc_db_data(lib                = rdbms,
            table              = qc_test,
            drop_columns       = %str('acct_id'),
            by_vars            = %str('acct_type_na'),
            where              = %str(acct_type_na like 'SAV%'),
            freq_limit         = 50
            )
```

qc_db_data.sas

```
%qc_db_data(
lib           = _db2,
table         = qc_test,
drop_columns  = %str('acct_id'),
by_vars       = %str('acct_type_na'),
where         =
     %str(acct_type_na like '%Visa%'),
 freq_limit   = 100
          );
```

qc_db_data.sas

```
proc contents data = &lib..&table
               out = _qc_db_columns_all
          ( keep =   name type formatl
          rename = ( name = colname )
          ) noprint;
run;
```

qc_db_data.sas

```
data _qc_db_columns;
      set _qc_db_columns_all;
      %if &drop_columns > %then %do;
            if colname not in ( %upcase(&drop_columns) );
      %end;

      %if &keep_columns > %then %do;
            if colname in ( %upcase(&keep_columns) );
      %end;

      if type = 1 then coltype = 'N'; else coltype = 'C';

      drop type;
  run;
```

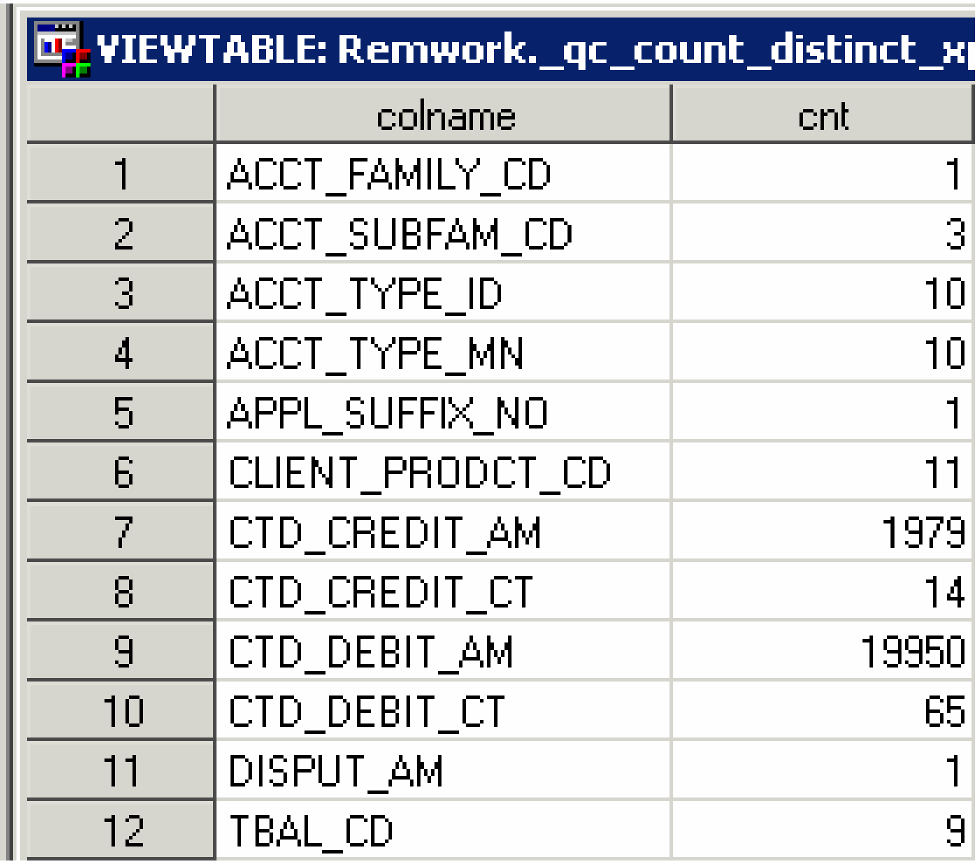
qc_db_data.sas

```
/*
 Create the count(distinct x) as x phrases.  The
 results of these will determine whether we do
 freq distribution on the variables
*/

select

'count (distinct(' || trim(colname) ||
      ')) as ' || trim(column_name)

 into :_qc_count_distinct separated by ’,’

 from _db_columns
```

qc_db_data.sas

```
/*
  Count distinct values of each variable,
  these counts used to decide if
  min/max/etc.. or freqs to be done
*/

  create table _qc_count_distinct as
      select &_qc_count_distinct
        from &lib..&table
      %if &where ne %then %do;
       where &where
      %end;
  ;
```

qc_db_data.sas



VIEWTABLE: Remwork._qc_count_distinct_x

	colname	cnt
1	ACCT_FAMILY_CD	1
2	ACCT_SUBFAM_CD	3
3	ACCT_TYPE_ID	10
4	ACCT_TYPE_MN	10
5	APPL_SUFFIX_NO	1
6	CLIENT_PRODCT_CD	11
7	CTD_CREDIT_AM	1979
8	CTD_CREDIT_CT	14
9	CTD_DEBIT_AM	19950
10	CTD_DEBIT_CT	65
11	DISPUT_AM	1
12	TBAL_CD	9

qc_db_data.sas

```
/* Numeric columns will be run through proc summary */

   select d.colname
     into :numeric_cols separated by ' '

     from _db_columns                              d,
          _qc_count_distinct_xpose                 c

    where d.colname   = c.colname
      and d.coltype   = 'N'
      and c.cnt       > &freq_limit
   ;

   %let numeric_fld_cnt    = &sqlobs;
```

qc_db_data.sas

```
/*
   Any column with < &freq_limit distinct values is freqqed.
   This means that some character columns will have no
   analysis performed on them, eg. name fields.
*/
   select d.colname, d.colname
     into :char_col1 - :char_col&sysmaxlong ,
          :char_cols   separated by ' '

     from _db_columns                 d,
          _qc_count_distinct_xpose    c

    where d.colname    = c.colname
      and c.cnt        <= &freq_limit ;

   %let char_fld_cnt   = &sqlobs;
```

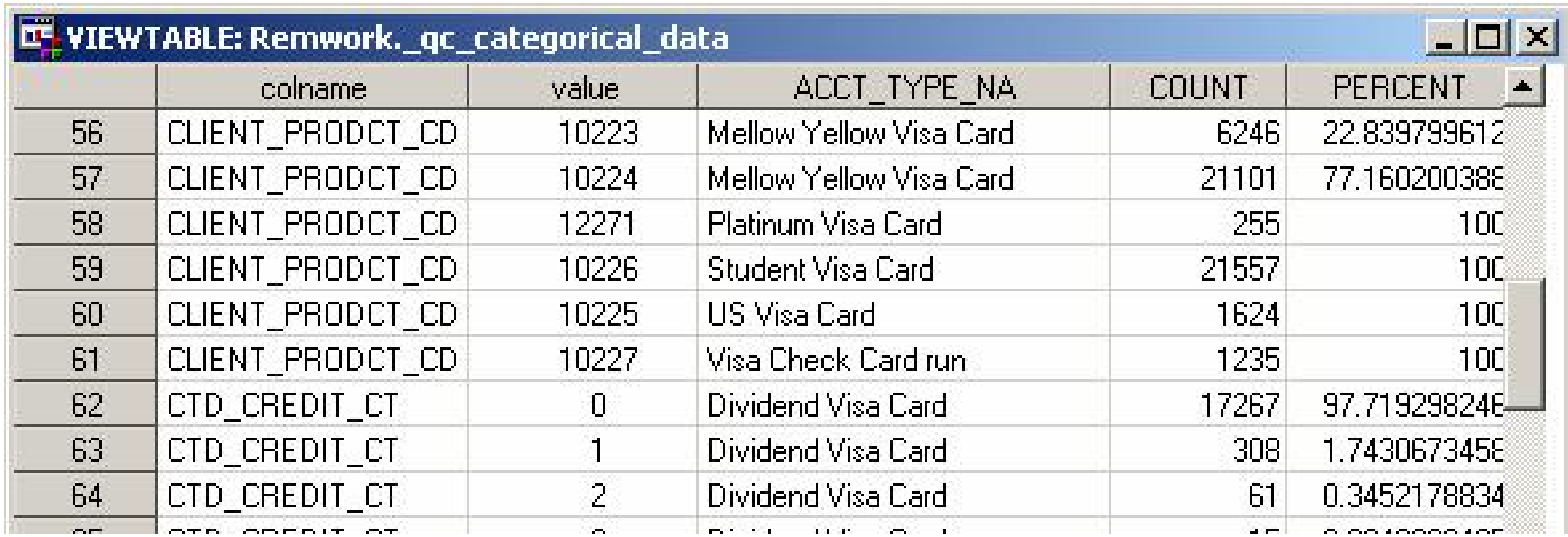
qc_db_data.sas

```
proc summary data = _&lib..&table
  ( keep = &numeric_cols
  &by_vars_stmt ) nway missing ;

  var &numeric_cols;

 * RDBMS sort order for mixed-
  case character columns differs;
  %if &by_vars_stmt ne %then %do;
```

qc_db_data.sas

```
proc freq data = &lib..&table
  ( keep = &char_cols &by_vars_stmt );

 * DB2 sort order for mixed-case character columns differs;
  %if &by_vars_stmt ne %then %do;
      by &by_vars_stmt notsorted;
  %end;

  %do i = 1 %to &char_fld_cnt;
      tables &&char_col&i / missing
        out = &&char_col&i
        ( rename = ( &&char_col&i = value )) ;
  %end;
run;
```

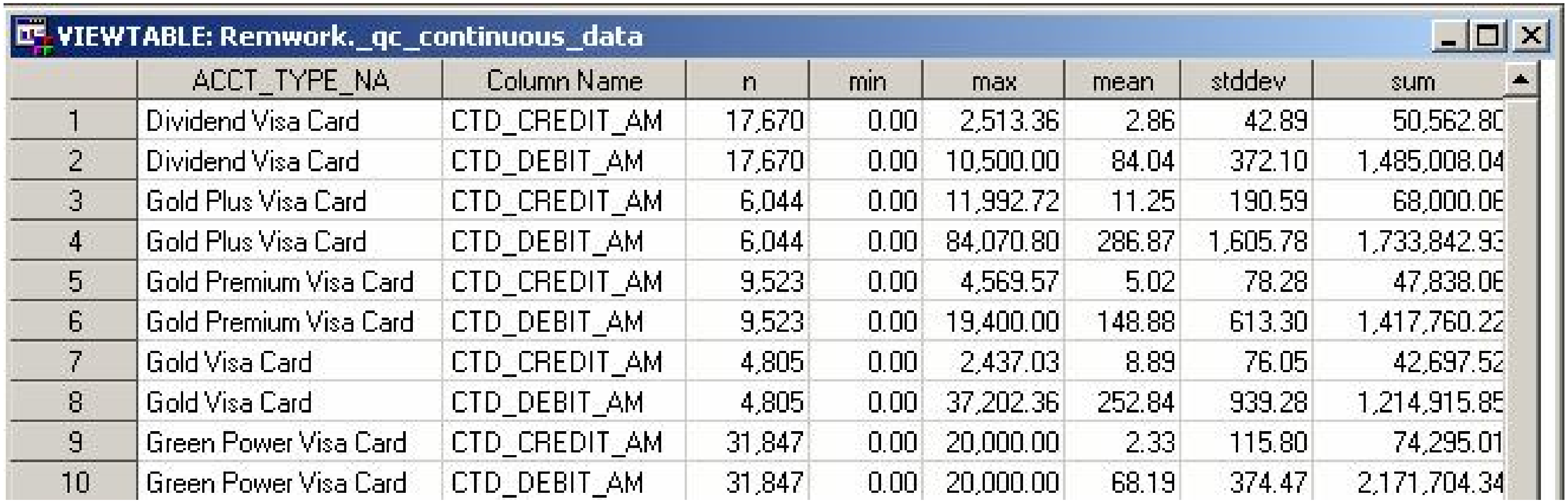
Results



VIEWTABLE: Remwork._qc_categorical_data

	colname	value	ACCT_TYPE_NA	COUNT	PERCENT
56	CLIENT_PRODCT_CD	10223	Mellow Yellow Visa Card	6246	22.839799612
57	CLIENT_PRODCT_CD	10224	Mellow Yellow Visa Card	21101	77.160200388
58	CLIENT_PRODCT_CD	12271	Platinum Visa Card	255	100
59	CLIENT_PRODCT_CD	10226	Student Visa Card	21557	100
60	CLIENT_PRODCT_CD	10225	US Visa Card	1624	100
61	CLIENT_PRODCT_CD	10227	Visa Check Card run	1235	100
62	CTD_CREDIT_CT	0	Dividend Visa Card	17267	97.719298246
63	CTD_CREDIT_CT	1	Dividend Visa Card	308	1.7430673458
64	CTD_CREDIT_CT	2	Dividend Visa Card	61	0.3452178834

Results



VIEWTABLE: Remwork._qc_continuous_data

	ACCT_TYPE_NA	Column Name	n	min	max	mean	stddev	sum
1	Dividend Visa Card	CTD_CREDIT_AM	17,670	0.00	2,513.36	2.86	42.89	50,562.80
2	Dividend Visa Card	CTD_DEBIT_AM	17,670	0.00	10,500.00	84.04	372.10	1,485,008.04
3	Gold Plus Visa Card	CTD_CREDIT_AM	6,044	0.00	11,992.72	11.25	190.59	68,000.06
4	Gold Plus Visa Card	CTD_DEBIT_AM	6,044	0.00	84,070.80	286.87	1,605.78	1,733,842.93
5	Gold Premium Visa Card	CTD_CREDIT_AM	9,523	0.00	4,569.57	5.02	78.28	47,838.06
6	Gold Premium Visa Card	CTD_DEBIT_AM	9,523	0.00	19,400.00	148.88	613.30	1,417,760.22
7	Gold Visa Card	CTD_CREDIT_AM	4,805	0.00	2,437.03	8.89	76.05	42,697.52
8	Gold Visa Card	CTD_DEBIT_AM	4,805	0.00	37,202.36	252.84	939.28	1,214,915.85
9	Green Power Visa Card	CTD_CREDIT_AM	31,847	0.00	20,000.00	2.33	115.80	74,295.01
10	Green Power Visa Card	CTD_DEBIT_AM	31,847	0.00	20,000.00	68.19	374.47	2,171,704.34

Conclusion

- leveraging metadata allows data driven code
  - SAS/Access LIBNAME engine
  - PROC CONTENTS
- data driven code = no maintenance
- no maintenance = happy programmer

Contact

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