- The Mongo Shell
- PyMongo

Accessing the mongo shell

TOP

This section shows usage of the MongoDB shell, but due to the non-interactive nature of the Jupyter Notebook cells, we show each interaction as a command-line invocation of the "mongo" shell client with the command to execute as an argument.

We start by defining an IPython alias to facilitate running mongo commands.

In [1]:

```
%alias mongo c:/Progs/MongoDB/bin/mongo.exe --eval %s localhost:27017/%s
```

NOTE: To use mongo alias, must be in quotes and only one statement (last one) is executed

NOTE: We must always give the name of a database (even one that doesn't exist) to be able to run a query

In [2]:

```
mongo "db.version()" ANY
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/ANY
3.2.3
```

Let's get a list of collections contained within the 'Money_UK' database:

In [3]:

```
mongo "db.getCollectionNames()" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
[ "CARD", "SAVING" ]
```

In [4]:

```
mongo "db.stats()" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{
        "db" : "Money_UK",
        "collections" : 2,
        "objects" : 2974,
        "avgObjSize" : 161.98520511096166,
        "dataSize" : 481744,
        "storageSize" : 192512,
        "numExtents" : 0,
        "indexes" : 2,
        "indexSize" : 53248,
        "ok" : 1
}
```

Let's see what commands are available in the MongoDB shell

In [5]:

```
mongo "db.help()" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
DB methods:
        db.adminCommand(nameOrDocument) - switches to 'admin' db, and r
uns command [ just calls db.runCommand(...) ]
        db.auth(username, password)
        db.cloneDatabase(fromhost)
        db.commandHelp(name) returns the help for the command
        db.copyDatabase(fromdb, todb, fromhost)
        db.createCollection(name, { size : ..., capped : ..., max : ...
} )
        db.createUser(userDocument)
        db.currentOp() displays currently executing operations in the d
b
        db.dropDatabase()
        db.eval() - deprecated
        db.fsyncLock() flush data to disk and lock server for backups
        db.fsyncUnlock() unlocks server following a db.fsyncLock()
        db.getCollection(cname) same as db['cname'] or db.cname
        db.getCollectionInfos([filter]) - returns a list that contains
the names and options of the db's collections
        db.getCollectionNames()
        db.getLastError() - just returns the err msg string
        db.getLastErrorObj() - return full status object
        db.getLogComponents()
        db.getMongo() get the server connection object
        db.getMongo().setSlaveOk() allow queries on a replication slave
server
        db.getName()
        db.getPrevError()
        db.getProfilingLevel() - deprecated
        db.getProfilingStatus() - returns if profiling is on and slow t
hreshold
        db.getReplicationInfo()
        db.getSiblingDB(name) get the db at the same server as this one
        db.getWriteConcern() - returns the write concern used for any o
perations on this db, inherited from server object if set
        db.hostInfo() get details about the server's host
        db.isMaster() check replica primary status
        db.killOp(opid) kills the current operation in the db
        db.listCommands() lists all the db commands
        db.loadServerScripts() loads all the scripts in db.system.js
        db.logout()
        db.printCollectionStats()
        db.printReplicationInfo()
        db.printShardingStatus()
        db.printSlaveReplicationInfo()
        db.dropUser(username)
        db.repairDatabase()
        db.resetError()
        db.runCommand(cmdObj) run a database command.  if cmdObj is a s
tring, turns it into { cmdObj : 1 }
        db.serverStatus()
        db.setLogLevel(level,<component>)
        db.setProfilingLevel(level,<slowms>) 0=off 1=slow 2=all
        db.setWriteConcern( <write concern doc> ) - sets the write conc
ern for writes to the db
```

```
        db.unsetWriteConcern( <write concern doc> ) - unsets the write
concern for writes to the db
        db.setVerboseShell(flag) display extra information in shell out
put
        db.shutdownServer()
        db.stats()
        db.version() current version of the server
```

Let's see how many documents exist in the CARD collection:

In [6]:

```
mongo "cc=db.CARD;print(cc.find().count())" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
1493
```

Let's see how many documents exist in the SAVING collection:

In [7]:

```
mongo "saving=db.SAVING;print(saving.find().count())" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
1481
```

Let's show the 'first' document in the CARD collection:

In [8]:

```
mongo "cc=db.CARD;cc.findOne()" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{
        "_id" : ObjectId("56cb51c37469f7afbc7f375b"),
        "date" : ISODate("1988-10-21T00:00:00Z"),
        "value" : 18.53,
        "info" : "Interest",
        "account" : "./UK_GBP_Access-CC",
        "tags" : [
                "interest",
                "interest"
        ],
        "comment" : ""
}
```

Let's search for any CARD documents with that same timestamp:

In [9]:

```
mongo "cc=db.CARD;cc.find({'date':ISODate('1988-09-27T00:00:00Z')})" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "_id" : ObjectId("56cb51c37469f7afbc7f375c"), "date" : ISODate("1988-
09-27T00:00:00Z"), "value" : 20.4, "info" : "Filton Tech. Coll.", "acco
unt" : "./UK_GBP_Access-CC", "tags" : [ "misc", "unknown" ], "comment"
: "" }
{ "_id" : ObjectId("56cb51c37469f7afbc7f375e"), "date" : ISODate("1988-
09-27T00:00:00Z"), "value" : 29.97, "info" : "Burtons, Glasgow", "accou
nt" : "./UK_GBP_Access-CC", "tags" : [ "bills", "clothes" ], "comment"
: "" }
```

Let's perform the same search but provide a projection to show only the value field

NOTE: it will show the '_id' index field unless we explicitly disable it.

In [10]:

```
mongo "cc=db.CARD;cc.find({'date':ISODate('1988-09-27T00:00:00Z')},{value:1})" Money_
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "_id" : ObjectId("56cb51c37469f7afbc7f375c"), "value" : 20.4 }
{ "_id" : ObjectId("56cb51c37469f7afbc7f375e"), "value" : 29.97 }
```

Now let's perform the same search but provide a projection to show only the value field, without the '_id' index field

In [11]:

```
mongo "cc=db.CARD;cc.find({'date':ISODate('1988-09-27T00:00:00Z')},{_id:0,value:1})"
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "value" : 20.4 }
{ "value" : 29.97 }
```

We can also perform the same search and sort the result in ASCENDING(1) or DESCENDING(-1) order:

In [12]:

```
mongo "cc=db.CARD;cc.find({'date':ISODate('1988-09-27T00:00:00Z')},{_id:0,value:1}).s
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "value" : 20.4 }
{ "value" : 29.97 }
```

In [13]:

```
mongo "cc=db.CARD;cc.find({'date':ISODate('1988-09-27T00:00:00Z')},{_id:0,value:1}).s
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "value" : 29.97 }
{ "value" : 20.4 }
```

In the following example we show many entries, but the output is automatically limited to 20 documents:

In [14]:

```
mongo "cc=db.CARD;cc.find({},{_id:0,value:1}).sort({value:1})" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "value" : -1695.61 }
{ "value" : -1200 }
{ "value" : -1000 }
{ "value" : -834.51 }
{ "value" : -715.46 }
{ "value" : -703.16 }
{ "value" : -670 }
{ "value" : -652.37 }
{ "value" : -600 }
{ "value" : -590 }
{ "value" : -535 }
{ "value" : -500 }
{ "value" : -490.21 }
{ "value" : -316.81 }
{ "value" : -238.42 }
{ "value" : -210 }
{ "value" : -200 }
{ "value" : -184.25 }
{ "value" : -150 }
{ "value" : -150 }
Type "it" for more
```

Here, we limit the output to only 5 documents:

In [15]:

```
mongo "cc=db.CARD;cc.find({},{_id:0,value:1}).sort({value:1}).limit(5)" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "value" : -1695.61 }
{ "value" : -1200 }
{ "value" : -1000 }
{ "value" : -834.51 }
{ "value" : -715.46 }
```

We can also specify to skip the first 5 documents (it will show the following 20 documents):

In [16]:

```
mongo "cc=db.CARD;cc.find({},{_id:0,value:1}).sort({value:1}).skip(5)" Money_UK
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "value" : -703.16 }
{ "value" : -670 }
{ "value" : -652.37 }
{ "value" : -600 }
{ "value" : -590 }
{ "value" : -535 }
{ "value" : -500 }
{ "value" : -490.21 }
{ "value" : -316.81 }
{ "value" : -238.42 }
{ "value" : -210 }
{ "value" : -200 }
{ "value" : -184.25 }
{ "value" : -150 }
{ "value" : -150 }
{ "value" : -124.94 }
{ "value" : -108.18 }
{ "value" : -107.84 }
{ "value" : -104.46 }
{ "value" : -104 }
Type "it" for more
```

SQL Equivalent

The equivalent query in SQL, for the query below, would be:

```
SELECT value            # Projection
FROM cc                 # Table (Collection)
WHERE value > -100.00   # select criteria
LIMIT 5                 # cursor modifier
```

Below we show the 1st five values with value less than -100.00

In [17]:

```
mongo "cc=db.CARD;cc.find({value:{$gt:-100.00}},{_id:0,value:1}).sort({value:1}).limi
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "value" : -85.58 }
{ "value" : -79.8 }
{ "value" : -76.15 }
{ "value" : -63.16 }
{ "value" : -50.1 }
```

or the info and value fields associated with all 'media_music' tags:

In [18]:

```
mongo "cc=db.CARD;cc.find({'tags':['media','music']},{_id:0,info:1,value:1})" Money_U
```

```
MongoDB shell version: 3.2.3
connecting to: localhost:27017/Money_UK
{ "value" : 27.41, "info" : "Sing Chong PTE Ltd." }
{ "value" : 23.25, "info" : "CD Cases Maplin" }
{ "value" : 18, "info" : "Sunrise Records, Toronto" }
{ "value" : 21.29, "info" : "Musique D\"Auteuil, Quebec" }
{ "value" : 29.5, "info" : "Tower Records, NY" }
{ "value" : 20.84, "info" : "The Wiz/New York" }
{ "value" : 16.87, "info" : "Records on Wheels, Ottawa" }
{ "value" : 65.92, "info" : "HMV,Manchester" }
{ "value" : 44.56, "info" : "French CDs,EuroM" }
{ "value" : 12.57, "info" : "CD,La FNAC{Paris, 121 F}" }
{ "value" : 15.37, "info" : "CD,film" }
{ "value" : 18.2, "info" : "CDs{Slade/J Winter, }" }
{ "value" : 36.67, "info" : "Carrefour CDs" }
{ "value" : 38.39, "info" : "La FNAC CDs" }
{ "value" : 33.29, "info" : "HMV CDs" }
{ "value" : 39, "info" : "Hi-Fi News/RR Subscription,Nov92-Jan94" }
{ "value" : 31.96, "info" : "HMV Oxford St." }
{ "value" : 25.68, "info" : "Carrefour CDs" }
{ "value" : 21.93, "info" : "Hi-Fi News/RR CD Service" }
{ "value" : 8.61, "info" : "Hi-Fi News/RR CD Service" }
Type "it" for more
```

Using the Pymongo driver

TOP

Now let's look at using the Pymongo driver to access our 'Money_UK' database.

Let's first connect to MongoDB, creating a 'client' object and then list the available databases:

In [19]:

```
# First install pymongo client:
#    conda install pymongo

from pymongo import MongoClient,ASCENDING,DESCENDING

client = MongoClient("mongodb://localhost:27017")

dbnames = [dbname for dbname in client.database_names() ]
print("Available databases: <" + str(dbnames))
```

```
Available databases: <['Money_UK', 'aggregation_example', 'local', 'tes
t']
```

Now let's explicitly connect to the 'Money_UK' DB and then list the collections contained within it:

In [20]:

```
db = client.Money_UK

dbname = db.name
print("Opened db<" + dbname + ">")
collnames = [collname for collname in db.collection_names() ]
print("Available collections in db<" + dbname + ">: " + str(collnames))
```

```
Opened db<Money_UK>
Available collections in db<Money_UK>: ['CARD', 'SAVING']
```

Below we perform a find() operation on the 'CARD' and 'SAVING' collections.

The find() method returns a cursor on which we can iterate.

We use the cursor to show just the first N(4) documents in each collection

In [21]:

```
# Query for All Documents in a Collection
# To return all documents in a collection, call the find() method without a criteria
# For example, the following operation queries for all documents in the restaurants c

CARD = db.CARD
SAVING = db.SAVING

cursor = CARD.find()
print()
print("Number of documents in CARD collection: " + str( cursor.count() ))
N=4
print("1st {} documents:".format(N))
for document in cursor.limit(N):
    print(document)

cursor = SAVING.find()
print()
print("Number of documents in SAVING collection: " + str( cursor.count() ))
N=4
print("1st {} documents:".format(N))
for document in cursor.limit(N):
    print(document)
```

```
Number of documents in CARD collection: 1493
1st 4 documents:
{'account': './UK_GBP_Access-CC', 'comment': '', '_id': ObjectId('56cb5
1c37469f7afbc7f375b'), 'date': datetime.datetime(1988, 10, 21, 0, 0),
'tags': ['interest', 'interest'], 'info': 'Interest', 'value': 18.53}
{'account': './UK_GBP_Access-CC', 'comment': '', '_id': ObjectId('56cb5
1c37469f7afbc7f375c'), 'date': datetime.datetime(1988, 9, 27, 0, 0), 't
ags': ['misc', 'unknown'], 'info': 'Filton Tech. Coll.', 'value': 20.4}
{'account': './UK_GBP_Access-CC', 'comment': '', '_id': ObjectId('56cb5
1c37469f7afbc7f375d'), 'date': datetime.datetime(1988, 9, 1, 0, 0), 'ta
gs': ['bills', 'house'], 'info': 'Flowers, W_O_T', 'value': 8.0}
{'account': './UK_GBP_Access-CC', 'comment': '', '_id': ObjectId('56cb5
1c37469f7afbc7f375e'), 'date': datetime.datetime(1988, 9, 27, 0, 0), 't
ags': ['bills', 'clothes'], 'info': 'Burtons, Glasgow', 'value': 29.97}

Number of documents in SAVING collection: 1481
1st 4 documents:
{'account': './UK_GBP_Barclays_CA', 'comment': '', '_id': ObjectId('56c
b51c47469f7afbc7f3ae3'), 'date': datetime.datetime(1988, 9, 27, 0, 0),
'tags': ['misc', 'pay'], 'info': 'ACCESS', 'value': -1200.0}
{'account': './UK_GBP_Barclays_CA', 'comment': '', '_id': ObjectId('56c
b51c47469f7afbc7f3ae4'), 'date': datetime.datetime(1988, 10, 3, 0, 0),
'tags': ['bills', 'house'], 'info': 'Mortgage', 'value': -317.9}
{'account': './UK_GBP_Barclays_CA', 'comment': '', '_id': ObjectId('56c
b51c47469f7afbc7f3ae5'), 'date': datetime.datetime(1988, 10, 1, 0, 0),
'tags': ['bills', 'house'], 'info': 'Rates', 'value': -58.4}
{'account': './UK_GBP_Barclays_CA', 'comment': '', '_id': ObjectId('56c
b51c47469f7afbc7f3ae6'), 'date': datetime.datetime(1988, 10, 1, 0, 0),
'tags': ['bills', 'house'], 'info': 'Endowment', 'value': -31.8}
```

We can also apply sorting the find() call, which also returns the cursor to use.

In the following example we see the effect of using ASCENDING or DESCENDING sort (in the descending case we see entries from year 2013).

In [23]:

```
cursor = SAVING.find().sort([ ('date', ASCENDING) ])

print()
print("Number of documents in SAVING collection: " + str( cursor.count() ))
N=4
print("1st {} documents: ORDERED by ASCENDING date".format(N))
for document in cursor.limit(N):
    print(document)

cursor = SAVING.find().sort([ ('date', DESCENDING) ])

print()
print("Number of documents in SAVING collection: " + str( cursor.count() ))
N=4
print("1st {} documents: ORDERED by DESCENDING date".format(N))
for document in cursor.limit(N):
    print(document)
```

```
Number of documents in SAVING collection: 1481
1st 4 documents: ORDERED by ASCENDING date
{'account': './UK_GBP_Barclays_CA', 'comment': '', '_id': ObjectId('56c
b51c47469f7afbc7f3af2'), 'date': datetime.datetime(1988, 9, 1, 0, 0),
'tags': ['fun', 'hols'], 'info': 'Borth YHA', 'value': -10.0}
{'account': './UK_GBP_Barclays_CA', 'comment': '', '_id': ObjectId('56c
b51c47469f7afbc7f3ae3'), 'date': datetime.datetime(1988, 9, 27, 0, 0),
'tags': ['misc', 'pay'], 'info': 'ACCESS', 'value': -1200.0}
{'account': './UK_GBP_Barclays_CA', 'comment': '', '_id': ObjectId('56c
b51c47469f7afbc7f3ae7'), 'date': datetime.datetime(1988, 9, 28, 0, 0),
'tags': ['salary', 'salary'], 'info': 'Wage', 'value': 883.65}
{'account': './UK_GBP_Barclays_CA', 'comment': '', '_id': ObjectId('56c
b51c47469f7afbc7f3ae5'), 'date': datetime.datetime(1988, 10, 1, 0, 0),
'tags': ['bills', 'house'], 'info': 'Rates', 'value': -58.4}

Number of documents in SAVING collection: 1481
1st 4 documents: ORDERED by DESCENDING date
{'account': './UK_GBP_FirstD_ESA', 'comment': '', '_id': ObjectId('56cb
51c57469f7afbc7f416d'), 'date': datetime.datetime(2013, 1, 31, 0, 0),
'tags': ['interest', 'int'], 'info': 'Interest', 'value': 0.1}
{'account': './UK_GBP_FirstD_ESA', 'comment': '', '_id': ObjectId('56cb
51c57469f7afbc7f416a'), 'date': datetime.datetime(2013, 1, 21, 0, 0),
'tags': ['transfer', 'transfer'], 'info': 'Transfer to France, Axa{for
Prestation Compensatoire}', 'value': -6520.0}
{'account': './UK_GBP_FirstD_ESA', 'comment': '', '_id': ObjectId('56cb
51c57469f7afbc7f416c'), 'date': datetime.datetime(2013, 1, 21, 0, 0),
'tags': ['bills', 'bank'], 'info': 'Cost Of Transfer{for Prestation Com
pensatoire}', 'value': -9.0}
{'account': './UK_GBP_FirstD_CA', 'comment': '', '_id': ObjectId('56cb5
1c57469f7afbc7f402f'), 'date': datetime.datetime(2013, 1, 19, 0, 0), 't
ags': ['transfer', 'transfer'], 'info': 'Transfer for Prestation Compen
satoire{FirstD-ESA}', 'value': -70.0}
```

Below we specify an empty match condition '{}' on the find() call, but we also provide a '{value: 1, _id: 0}' projection so that this cursor only returns the value field for each document.

In [24]:

```
cursor = SAVING.find(
    # SELECTION CRITERIA:
    {},
    # PROJECTION ('columns')
    {'value': 1, '_id': 0}).\
  sort([ ('date', ASCENDING) ])

print()
print("Number of documents in SAVING collection: " + str( cursor.count() ))
N=4
print("1st {} documents: ORDERED by ASCENDING date".format(N))
for document in cursor.limit(N):
    print(document)
```

```
Number of documents in SAVING collection: 1481
1st 4 documents: ORDERED by ASCENDING date
{'value': -10.0}
{'value': -1200.0}
{'value': 883.65}
{'value': -58.4}
```

This example searches for documents with 'salary' 'salary' as tags, and projects 'value' and 'date' fields.

This code will show the salary progression in the data over the period - nice salary increase, +67% in 3.5 years ... the gravy train went through here !

In [25]:

```
cursor = SAVING.find(
    {'tags': ['salary','salary']},
    {'value': 1, 'date': 1, '_id': 0}
).\
  sort([ ('date', ASCENDING) ])

#print(cursor)
print(cursor.count())

print()
print("Number of documents in SAVING collection: " + str( cursor.count() ))
N=100
print("1st {} documents: ORDERED by ASCENDING date".format(N))
#wages={}
wages=[]
dates=[]
for document in cursor.limit(N):
    print(document)
    # wages[ document['date'] ] = document['value']
    wages.append( document['value'] )
    dates.append( document['date'] )
    #print(document['value'])
```

```
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Number of documents in SAVING collection: 44
1st 100 documents: ORDERED by ASCENDING date
{'date': datetime.datetime(1988, 9, 28, 0, 0), 'value': 883.65}
{'date': datetime.datetime(1988, 10, 28, 0, 0), 'value': 920.4}
{'date': datetime.datetime(1988, 11, 28, 0, 0), 'value': 998.15}
{'date': datetime.datetime(1988, 12, 30, 0, 0), 'value': 1323.36}
{'date': datetime.datetime(1989, 1, 28, 0, 0), 'value': 998.4}
{'date': datetime.datetime(1989, 2, 28, 0, 0), 'value': 998.15}
{'date': datetime.datetime(1989, 3, 31, 0, 0), 'value': 985.9}
{'date': datetime.datetime(1989, 4, 30, 0, 0), 'value': 965.63}
{'date': datetime.datetime(1989, 5, 31, 0, 0), 'value': 1340.54}
{'date': datetime.datetime(1989, 6, 30, 0, 0), 'value': 979.67}
{'date': datetime.datetime(1989, 7, 31, 0, 0), 'value': 1001.33}
{'date': datetime.datetime(1989, 8, 31, 0, 0), 'value': 1093.38}
{'date': datetime.datetime(1989, 9, 30, 0, 0), 'value': 1053.38}
{'date': datetime.datetime(1989, 10, 31, 0, 0), 'value': 1093.13}
{'date': datetime.datetime(1989, 11, 30, 0, 0), 'value': 1535.87}
{'date': datetime.datetime(1989, 12, 30, 0, 0), 'value': 1106.22}
{'date': datetime.datetime(1990, 1, 30, 0, 0), 'value': 1106.47}
{'date': datetime.datetime(1990, 2, 28, 0, 0), 'value': 1176.72}
{'date': datetime.datetime(1990, 3, 31, 0, 0), 'value': 1223.22}
{'date': datetime.datetime(1990, 4, 27, 0, 0), 'value': 1216.56}
{'date': datetime.datetime(1990, 5, 31, 0, 0), 'value': 1448.59}
{'date': datetime.datetime(1990, 6, 30, 0, 0), 'value': 1227.96}
{'date': datetime.datetime(1990, 7, 31, 0, 0), 'value': 1227.96}
{'date': datetime.datetime(1990, 8, 31, 0, 0), 'value': 1157.56}
{'date': datetime.datetime(1990, 9, 30, 0, 0), 'value': 1227.96}
{'date': datetime.datetime(1990, 10, 31, 0, 0), 'value': 1227.96}
{'date': datetime.datetime(1990, 12, 1, 0, 0), 'value': 1460.11}
{'date': datetime.datetime(1990, 12, 28, 0, 0), 'value': 1227.96}
{'date': datetime.datetime(1991, 1, 31, 0, 0), 'value': 1227.56}
{'date': datetime.datetime(1991, 2, 28, 0, 0), 'value': 1188.36}
{'date': datetime.datetime(1991, 3, 31, 0, 0), 'value': 1337.56}
{'date': datetime.datetime(1991, 4, 28, 0, 0), 'value': 1327.15}
{'date': datetime.datetime(1991, 5, 28, 0, 0), 'value': 1697.15}
{'date': datetime.datetime(1991, 6, 28, 0, 0), 'value': 1374.25}
{'date': datetime.datetime(1991, 7, 28, 0, 0), 'value': 1374.25}
{'date': datetime.datetime(1991, 8, 28, 0, 0), 'value': 1274.25}
{'date': datetime.datetime(1991, 9, 28, 0, 0), 'value': 1374.25}
{'date': datetime.datetime(1991, 10, 28, 0, 0), 'value': 1374.25}
{'date': datetime.datetime(1991, 11, 28, 0, 0), 'value': 1605.24}
{'date': datetime.datetime(1991, 12, 28, 0, 0), 'value': 1374.25}
{'date': datetime.datetime(1992, 1, 28, 0, 0), 'value': 1374.25}
{'date': datetime.datetime(1992, 2, 28, 0, 0), 'value': 1374.05}
{'date': datetime.datetime(1992, 3, 28, 0, 0), 'value': 1499.25}
{'date': datetime.datetime(1992, 4, 28, 0, 0), 'value': 1495.1}
```
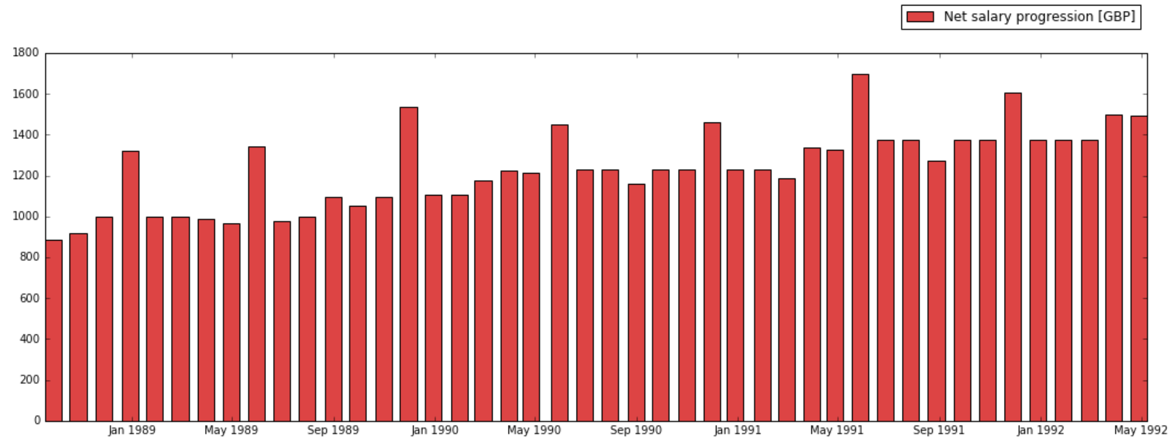

Now let's plot that progression

In [26]:

```
%pylab
%matplotlib inline

# Note: above needs matplotlib
#       conda install matplotlib

ax = plt.subplot(111)
#plt.plot(dates, wages, 'r^', label='salary progression', linestyle='solid') #drawsty
ax.bar(dates, wages, width=20, label='Net salary progression [GBP]', align='center',
ax.legend(bbox_to_anchor=(1.0, 1.15)).draggable()

## Modify axis:
mybox = ax.get_position()
ax.set_position([mybox.x0, mybox.y0, mybox.width * 3.0, mybox.height*1.5])

#legend()
#?plot
#?bar
```

```
Using matplotlib backend: Qt4Agg
Populating the interactive namespace from numpy and matplotlib
```



Aggregation

Now let's look at an aggregation example where we want to count the animals by type in the 'tags' field of the data.

We first 'map' the data (using '$unwind' operation) onto a simpler structure (with only 1 tag per document),

then we count ('reduce') the tags with the '$group/$sum' operations.

In [29]:

```
>>> from pymongo import MongoClient
>>> db = MongoClient().aggregation_example
>>> result = db.things.insert_many([{"x": 1, "tags": ["dog", "cat"]},
...                                 {"x": 2, "tags": ["cat"]},
...                                 {"x": 2, "tags": ["mouse", "cat", "dog"]},
...                                 {"x": 3, "tags": []}])
>>> result.inserted_ids

>>> from bson.son import SON
>>> pipeline = [
...     {"$unwind": "$tags"},
...     {"$group": {"_id": "$tags", "count": {"$sum": 1}}},
...     {"$sort": SON([("count", -1), ("_id", -1)])}
... ]
>>> list(db.things.aggregate(pipeline))
```

Out[29]:

```
[{'_id': 'cat', 'count': 3},
 {'_id': 'dog', 'count': 2},
 {'_id': 'mouse', 'count': 1}]
```

Now let's return to our 'Money_UK' database and use aggregation to see which categories of expenditure were the most important by grouping on the tags whilst summing the total values.

We will then plot this as a pie chart

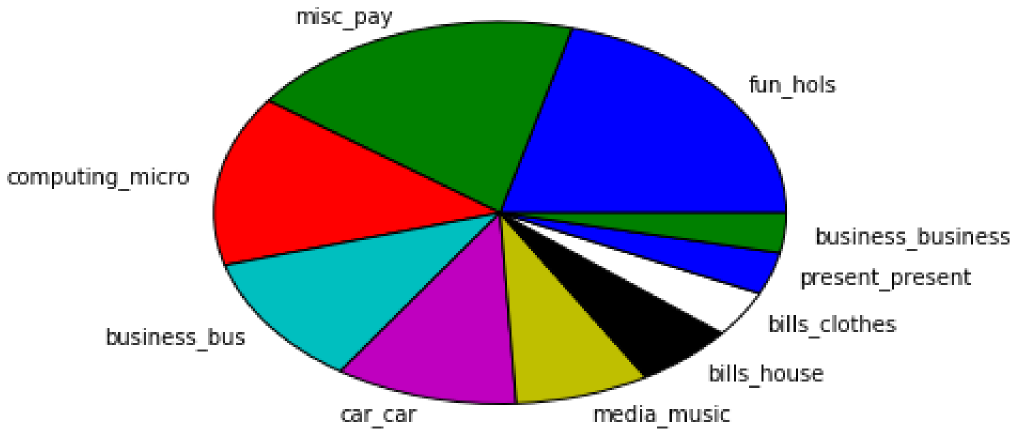
In [31]:

```
db = client.Money_UK

dbname = db.name
print("Opened db<" + dbname + ">")
collnames = [collname for collname in db.collection_names() ]
print("Available collections in db<" + dbname + ">: " + str(collnames))

from bson.son import SON

pipeline = [
     {"$group": {"_id": "$tags", "total": {"$sum": {"$abs": "$value"}}}},
     {"$sort": SON([("total", -1), ("_id", -1)])}
]

N=10
groups=[]
values=[]
for item in list(CARD.aggregate(pipeline))[:N]:
    print(item)
    groups.append (item['_id'][0]+"_"+item['_id'][1] )
    values.append (item['total'] )


pie(x=values,labels=groups)
```

```
Opened db<Money_UK>
Available collections in db<Money_UK>: ['CARD', 'SAVING']
{'total': 12792.72, '_id': ['fun', 'hols']}
{'total': 11652.940000000002, '_id': ['misc', 'pay']}
{'total': 8805.89, '_id': ['computing', 'micro']}
{'total': 6818.120000000001, '_id': ['business', 'bus']}
{'total': 6311.000000000002, '_id': ['car', 'car']}
{'total': 4642.729999999999, '_id': ['media', 'music']}
{'total': 3439.37, '_id': ['bills', 'house']}
{'total': 2400.4499999999994, '_id': ['bills', 'clothes']}
{'total': 2184.15, '_id': ['present', 'present']}
{'total': 2053.85, '_id': ['business', 'business']}
```

Out[31]:

```
([<matplotlib.patches.Wedge at 0x85f0e10>,
  <matplotlib.patches.Wedge at 0x88002e8>,
  <matplotlib.patches.Wedge at 0x8800f28>,
  <matplotlib.patches.Wedge at 0x8806ba8>,
  <matplotlib.patches.Wedge at 0x880d828>,
  <matplotlib.patches.Wedge at 0x88114a8>,
  <matplotlib.patches.Wedge at 0x8818128>,
  <matplotlib.patches.Wedge at 0x8818d68>,
  <matplotlib.patches.Wedge at 0x881e9e8>,
  <matplotlib.patches.Wedge at 0x8824668>],
 [<matplotlib.text.Text at 0x87fbe48>,
  <matplotlib.text.Text at 0x8800ac8>,
  <matplotlib.text.Text at 0x8806748>,
  <matplotlib.text.Text at 0x880d3c8>,
  <matplotlib.text.Text at 0x880df28>,
  <matplotlib.text.Text at 0x8811c88>,
  <matplotlib.text.Text at 0x8818908>,
  <matplotlib.text.Text at 0x881e588>,
  <matplotlib.text.Text at 0x8824208>,
  <matplotlib.text.Text at 0x8824e48>])
```



In [32]:

```
%%javascript
IPython.OutputArea.auto_scroll_threshold = 9999;
// This is just to prevent scroll bars on the next section
```

Now let's perform aggregation by year to see how those categories evolved over time.

Note that we now project a new field 'year' a string derived from the 'date' field.

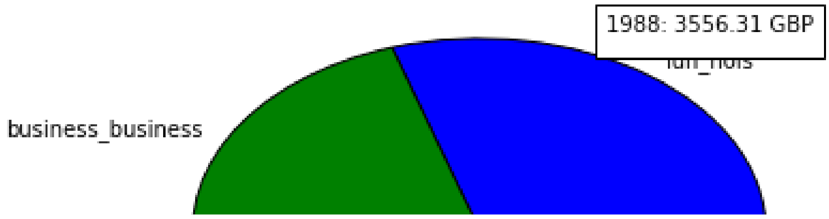
We then match on the year to only analyse data for that year and sort on the total as before.

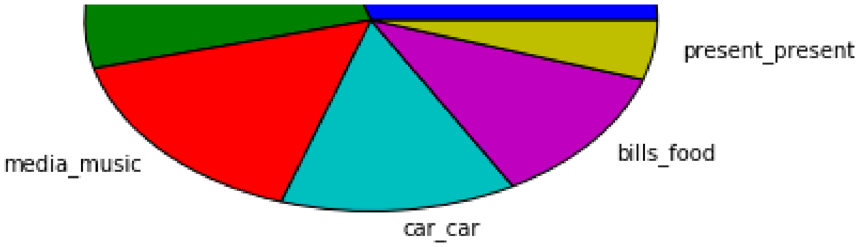
Once we have aggregated the data for each year we then create a pie chart for that year, showing the top 6 categories

In [33]:

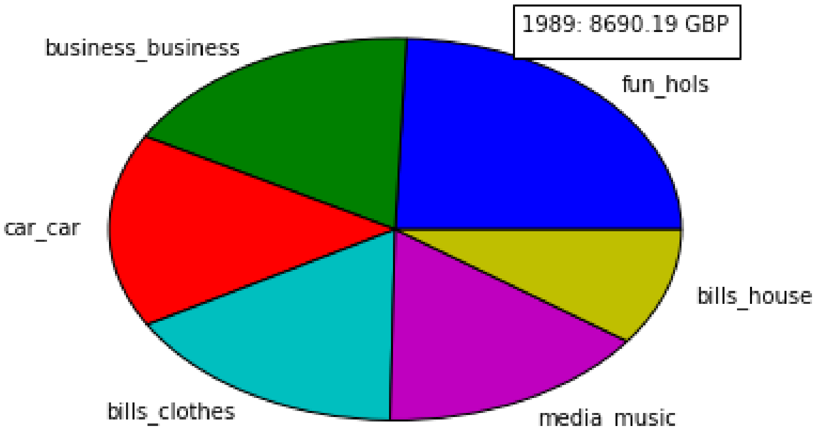
```
from bson.son import SON


def money(value):
    return int(100 * value)/100.0

N=6
for year in range(1988,2016):
    print(year)
    pipeline = [
        { "$project": {
            'year': { "$dateToString": { 'format': "%Y", 'date': "$date" } },
            'tags': 1,
            'value': 1,
            },
        },
        { "$match": { 'year': str(year) }},
        { "$group": {"_id": "$tags", "total": {"$sum": {"$abs": "$value"}}} },
        { "$sort":  SON([("total", -1), ("_id", -1)]) }
    ]
    #print( list(CARD.aggregate(pipeline))[:N] )

    groups=[]
    values=[]
    total = 0.0
    for item in list(CARD.aggregate(pipeline)):
        total += item['total']

    for item in list(CARD.aggregate(pipeline))[:N]:
        print(item)
        groups.append (item['_id'][0]+"_"+item['_id'][1] )
        values.append (item['total'] )

    pie(x=values,labels=groups)
    title = str(year) + ": " + str(money(total)) + " GBP"

    legend(title=title,labels=[])
    show()

''''''
```

```
1988
{'total': 923.8, '_id': ['fun', 'hols']}
{'total': 745.08, '_id': ['business', 'business']}
{'total': 489.39000000000004, '_id': ['media', 'music']}
{'total': 411.51, '_id': ['car', 'car']}
{'total': 361.28, '_id': ['bills', 'food']}
{'total': 155.53, '_id': ['present', 'present']}
```

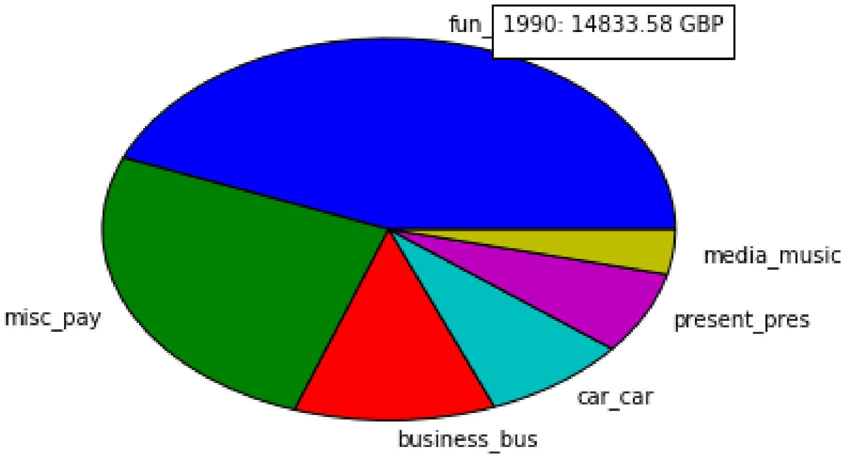




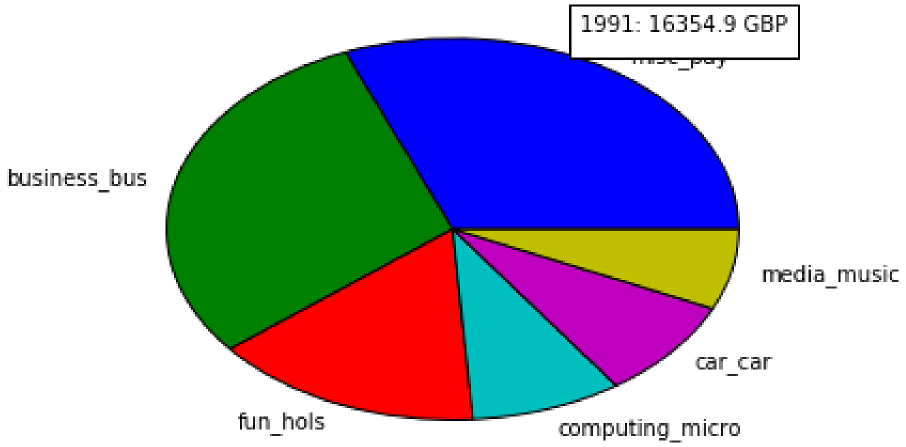
```
1989
{'total': 1567.31, '_id': ['fun', 'hols']}
{'total': 1127.23, '_id': ['business', 'business']}
{'total': 1055.81, '_id': ['car', 'car']}
{'total': 1053.8000000000002, '_id': ['bills', 'clothes']}
{'total': 985.4400000000002, '_id': ['media', 'music']}
{'total': 640.86, '_id': ['bills', 'house']}
```



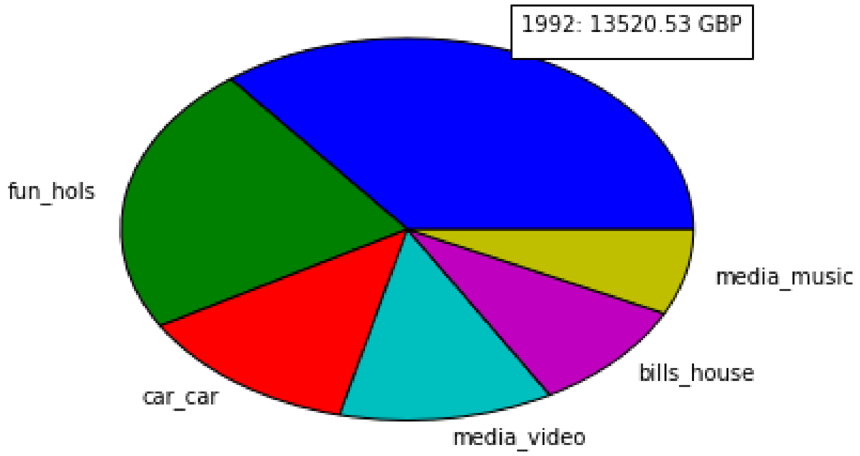
```
1990
{'total': 5162.360000000001, '_id': ['fun', 'hols']}
{'total': 3035.06, '_id': ['misc', 'pay']}
{'total': 1335.1599999999999, '_id': ['business', 'bus']}
{'total': 967.56, '_id': ['car', 'car']}
{'total': 819.39, '_id': ['present', 'pres']}
{'total': 446.57000000000016, '_id': ['media', 'music']}
```



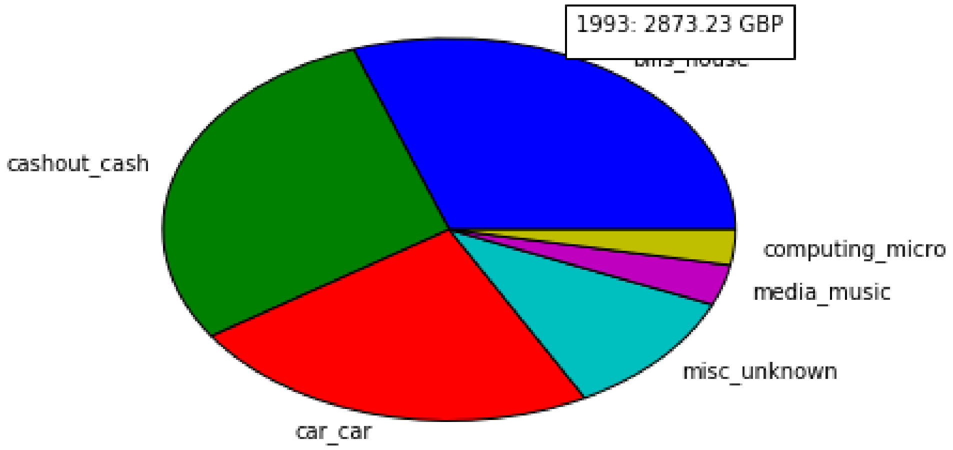
```
1991
{'total': 3856.2000000000003, '_id': ['misc', 'pay']}
{'total': 3681.3300000000004, '_id': ['business', 'bus']}
{'total': 1896.34, '_id': ['fun', 'hols']}
{'total': 1061.72, '_id': ['computing', 'micro']}
{'total': 1048.65, '_id': ['car', 'car']}
{'total': 848.1800000000001, '_id': ['media', 'music']}
```



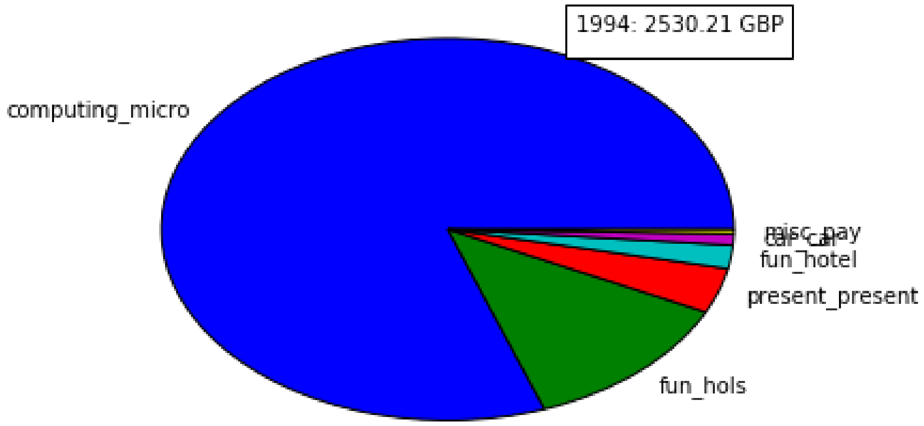
```
1992
{'total': 3778.0599999999995, '_id': ['misc', 'pay']}
{'total': 2424.59, '_id': ['fun', 'hols']}
{'total': 1355.2700000000002, '_id': ['car', 'car']}
{'total': 1283.54, '_id': ['media', 'video']}
{'total': 1002.5799999999999, '_id': ['bills', 'house']}
{'total': 770.95, '_id': ['media', 'music']}
```



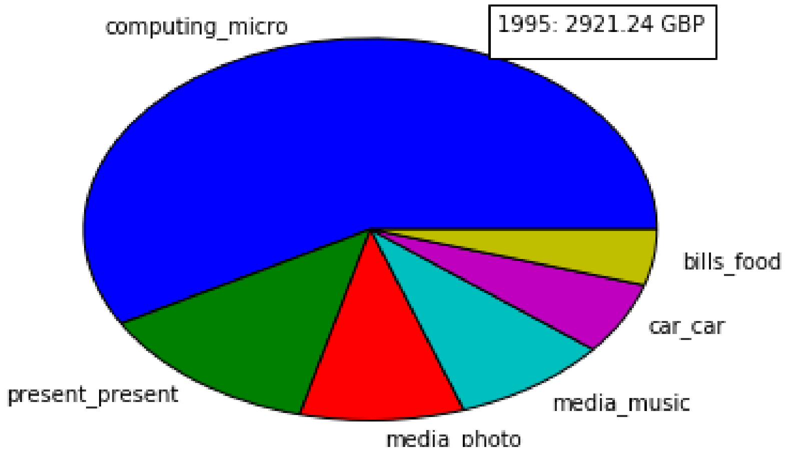
```
1993
{'total': 842.9, '_id': ['bills', 'house']}
{'total': 802.9300000000001, '_id': ['cashout', 'cash']}
{'total': 649.74, '_id': ['car', 'car']}
{'total': 297.0, '_id': ['misc', 'unknown']}
{'total': 95.1, '_id': ['media', 'music']}
{'total': 82.66, '_id': ['computing', 'micro']}
```



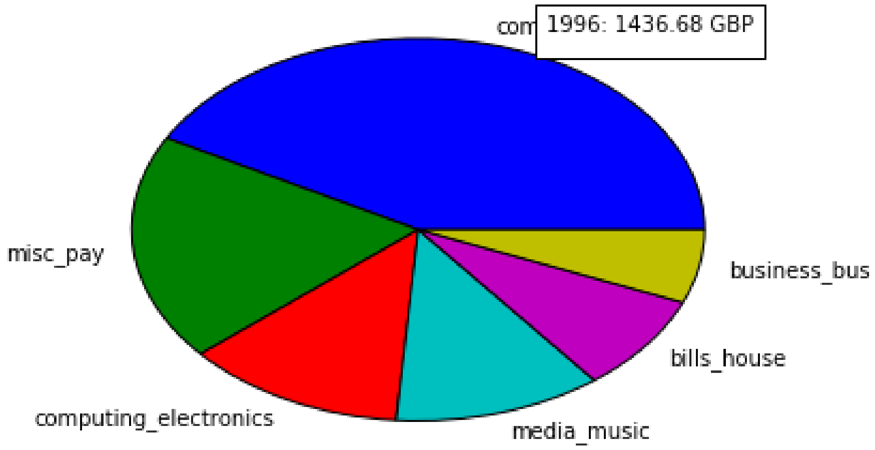
```
1994
{'total': 2030.0, '_id': ['computing', 'micro']}
{'total': 312.38, '_id': ['fun', 'hols']}
{'total': 96.55, '_id': ['present', 'present']}
{'total': 49.91, '_id': ['fun', 'hotel']}
{'total': 23.33, '_id': ['car', 'car']}
{'total': 10.0, '_id': ['misc', 'pay']}
```



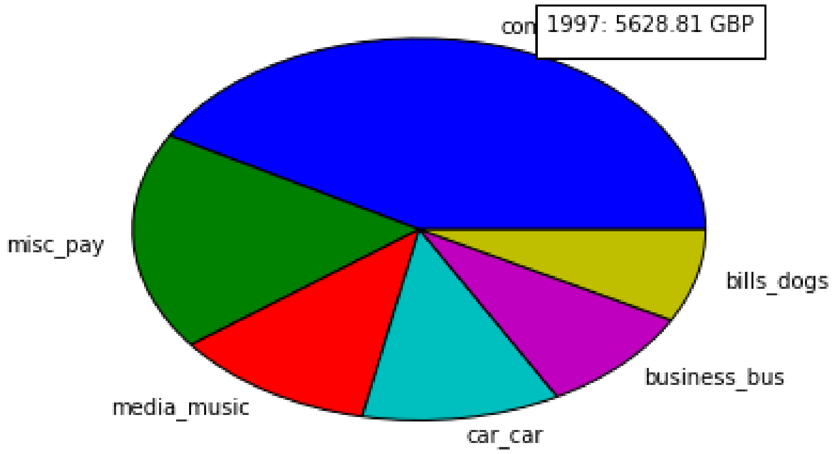
```
1995
{'total': 1466.5900000000001, '_id': ['computing', 'micro']}
{'total': 322.83, '_id': ['present', 'present']}
{'total': 233.29, '_id': ['media', 'photo']}
{'total': 223.98000000000002, '_id': ['media', 'music']}
{'total': 153.43, '_id': ['car', 'car']}
{'total': 119.06, '_id': ['bills', 'food']}
```



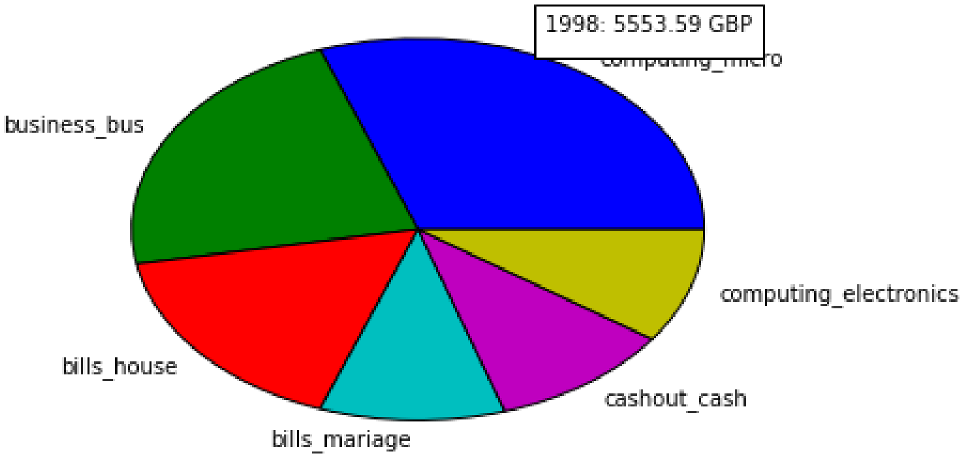
```
1996
{'total': 445.64000000000004, '_id': ['computing', 'micro']}
{'total': 203.5, '_id': ['misc', 'pay']}
{'total': 132.46, '_id': ['computing', 'electronics']}
{'total': 124.81, '_id': ['media', 'music']}
{'total': 87.09, '_id': ['bills', 'house']}
{'total': 66.0, '_id': ['business', 'bus']}
```



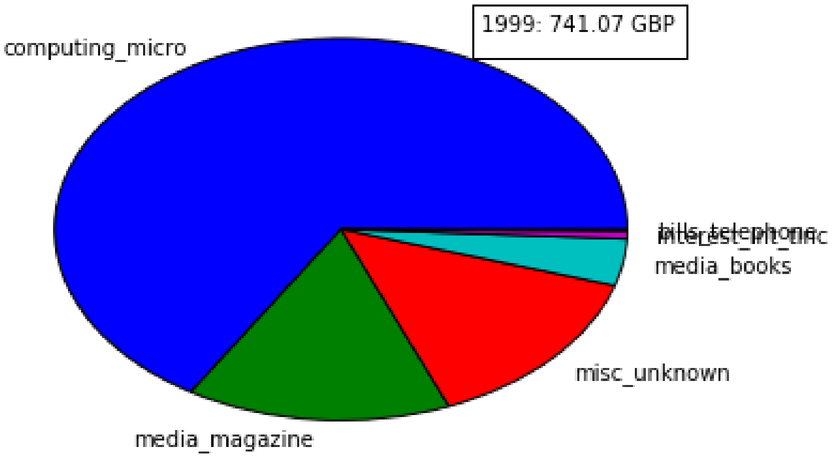
```
1997
{'total': 1499.81, '_id': ['computing', 'micro']}
{'total': 663.67, '_id': ['misc', 'pay']}
{'total': 411.51, '_id': ['media', 'music']}
{'total': 401.40000000000003, '_id': ['car', 'car']}
{'total': 326.95000000000005, '_id': ['business', 'bus']}
{'total': 282.69, '_id': ['bills', 'dogs']}
```



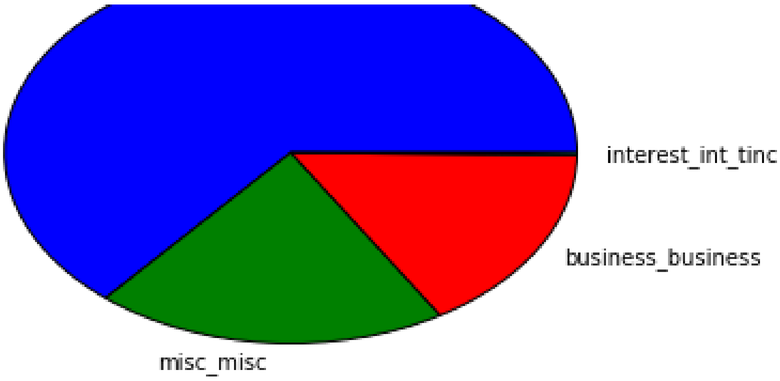
```
1998
{'total': 1093.6000000000001, '_id': ['computing', 'micro']}
{'total': 800.52, '_id': ['business', 'bus']}
{'total': 592.29, '_id': ['bills', 'house']}
{'total': 374.73, '_id': ['bills', 'mariage']}
{'total': 370.33, '_id': ['cashout', 'cash']}
{'total': 349.02, '_id': ['computing', 'electronics']}
```



```
1999
{'total': 490.74, '_id': ['computing', 'micro']}
{'total': 110.58, '_id': ['media', 'magazine']}
{'total': 104.46, '_id': ['misc', 'unknown']}
{'total': 29.39, '_id': ['media', 'books']}
{'total': 4.82, '_id': ['interest', 'int_tinc']}
{'total': 1.08, '_id': ['bills', 'telephone']}
```

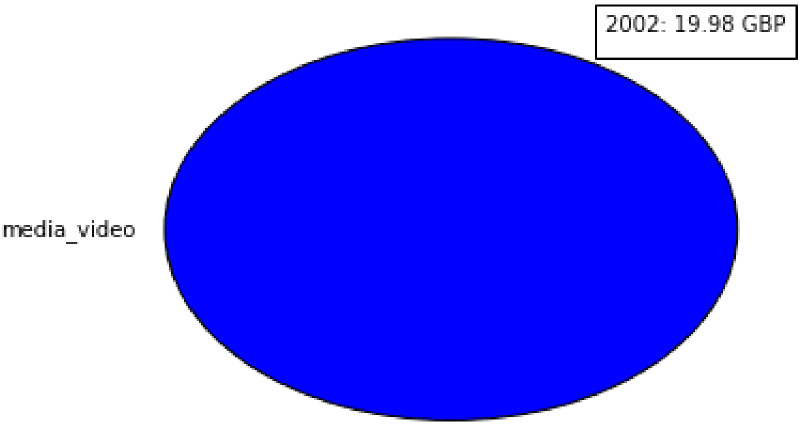


```
2000
{'total': 108.18, '_id': ['computing', 'micro']}
{'total': 33.81, '_id': ['misc', 'misc']}
{'total': 27.200000000000003, '_id': ['business', 'business']}
{'total': 0.37, '_id': ['interest', 'int_tinc']}
```



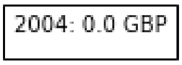
```
2001
```

```
2002
{'total': 19.99, '_id': ['media', 'video']}
```

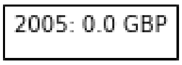


```
2003
```

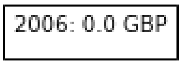
```
2004
```



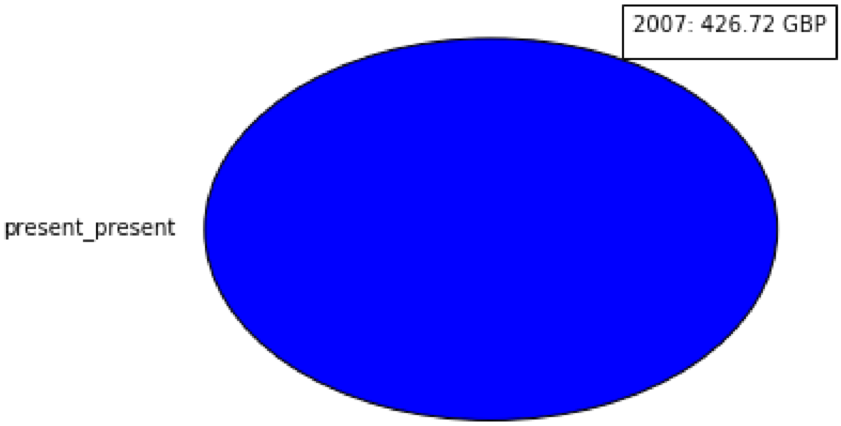
```
2005
```



```
2006
```

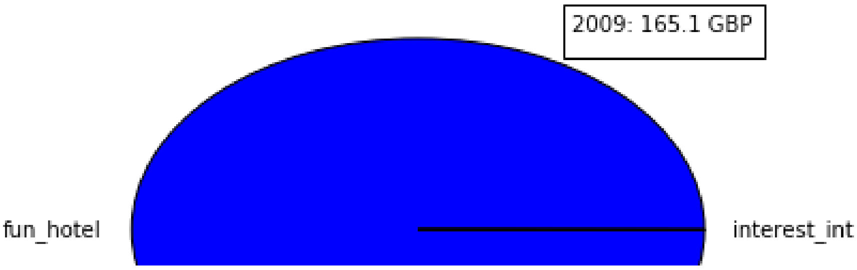


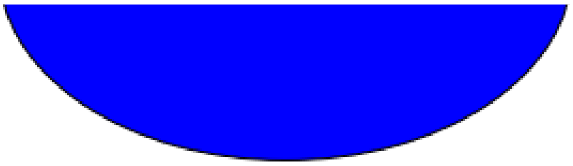
```
2007
{'total': 426.72, '_id': ['present', 'present']}
```



```
2008
```

```
2009
{'total': 165.03, '_id': ['fun', 'hotel']}
{'total': 0.07, '_id': ['interest', 'int']}
```





```
2010
```

```
2011
```

```
2012
```

```
2013
```

```
2014
```

```
2015
```

```
Out[33]:

''
```