FX homework 2

For the constraint equations to calibrate SABR, prof Fisher has discussed at length in class and thus I won't repeat here. The constraints can be seen in sabr_calibration.py

The below table shows calibration results and the optimizer I set up was only able to converge to 5 decimal places for the first 3 tenors (SSE is sum of the squared errors and is shown to be 1e-5). For subsequent tenors, the convergence was almost absolute.

In [1]:
```
from sabr_calibration import execute_hw
execute_hw()
```

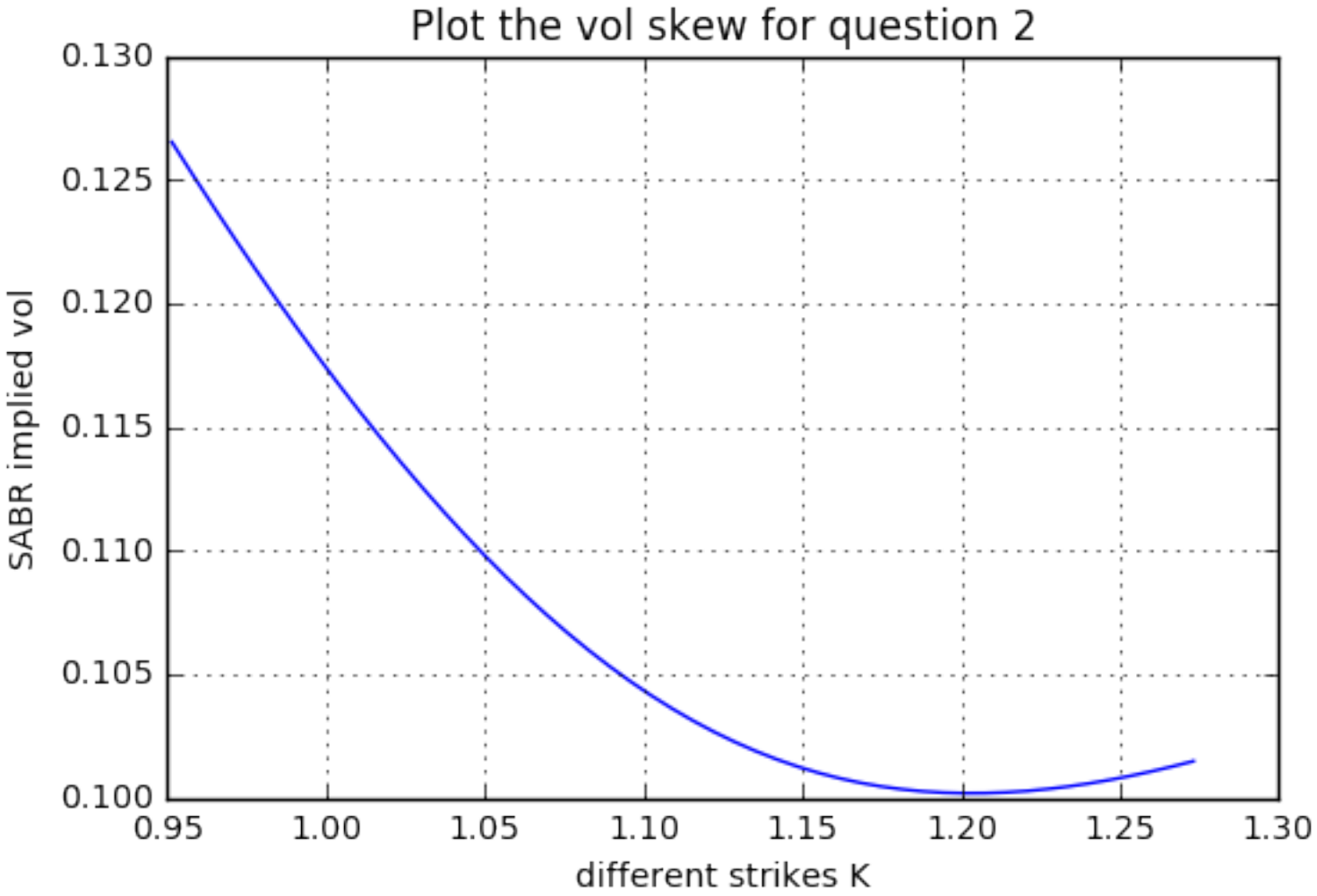
```
C:\Program Files\Anaconda3\lib\site-packages\pandas\core\indexing.py:132: Set
tingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/st
able/indexing.html#indexing-view-versus-copy
  self._setitem_with_indexer(indexer, value)
```

	T	K_atm	K_bf_put	K_bf_call	K_rr_put	K_rr_call	vol_atm	\
ON	0.008219	1.100113	1.095314	1.104934	1.094624	1.105987	0.078127	
1W	0.019178	1.100357	1.088196	1.112661	1.088674	1.112947	0.115289	
2W	0.038356	1.100684	1.084345	1.117287	1.084370	1.118175	0.110108	
1M	0.090411	1.101488	1.078999	1.124492	1.079359	1.124916	0.099500	
2M	0.169863	1.102873	1.070929	1.135861	1.070998	1.135945	0.103500	
3M	0.249315	1.104177	1.065996	1.143873	1.065663	1.143459	0.102000	
6M	0.498630	1.108398	1.054171	1.165747	1.052458	1.163484	0.102500	
1Y	1.008219	1.117105	1.039672	1.201000	1.036142	1.195765	0.103000	

	vol_bf_put	vol_bf_call	vol_rr_put	vol_rr_call	alpha	beta	\
ON	0.082716	0.082464	0.081912	0.084342	0.080320	-0.015934	
1W	0.117515	0.118874	0.114180	0.119019	0.102375	1.976733	
2W	0.115277	0.116699	0.113064	0.117317	0.097851	1.677817	
1M	0.100070	0.103418	0.100026	0.103526	0.083584	2.566917	
2M	0.105510	0.105990	0.105501	0.106001	0.100550	1.066705	
3M	0.105453	0.103543	0.105504	0.103504	0.106035	0.351538	
6M	0.108798	0.101646	0.109081	0.101581	0.116565	-0.530458	
1Y	0.111191	0.100175	0.111692	0.100192	0.119504	-0.618440	

	nu	success	SSE
ON	-10.231449	False	1.476878e-04
1W	4.014948	False	7.755207e-05
2W	4.128268	False	3.652252e-05
1M	1.761319	True	1.110599e-18
2M	1.264823	True	7.969444e-21
3M	1.103226	True	1.249882e-22
6M	0.802007	True	6.058090e-24
1Y	0.549554	True	5.495202e-20




```
Find strikes for delta of 10% using 1Y calibration results
K_10_put = 0.951441
K_10_call = 1.273172
```